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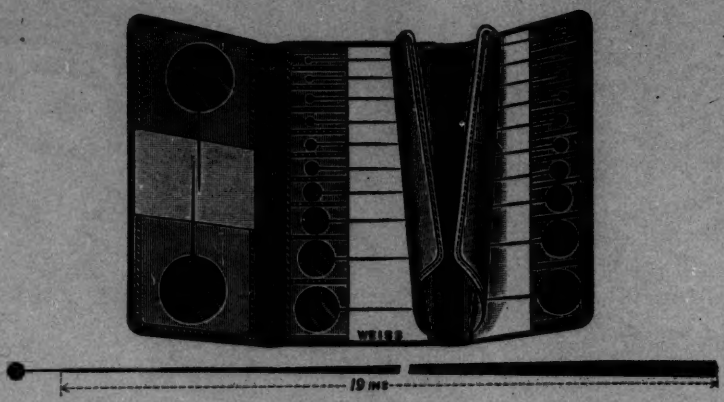

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(1853—1917.)

To face page 213.

THE BRITISH JOURNAL
OF
OPHTHALMOLOGY.

APRIL, 1917.

OBITUARY.

Walter Hamilton Hylton Jessop, M.A., M.B.Cantab., F.R.C.S.England.

SENIOR OPHTHALMIC SURGEON TO ST. BARTHOLOMEW'S HOSPITAL; PRESIDENT OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

WITH sincere regret we record the death of Mr. Jessop. He was quite well on February 10th, and went to the hospital; he came back after an hour or two, feeling cold and ill, took to his bed, developed pneumonia, and died within the week. He had seemed to be in his usual strength and spirits, abounding in go and energy, but it was known that the extra work entailed by the war, both at St. Bartholomew's and at No. I General Hospital, Camberwell, as well as his enthusiastic labour for the new BRITISH JOURNAL OF OPHTHALMOLOGY had tired him, and left him ill prepared to resist an attack of acute pneumonia.

He was born in 1853, the son of Walter Jessop, F.R.C.S., of Cheltenham; he was educated at Cheltenham College, on the modern side, at Bedford School, and, later, at Gonville and Caius College, Cambridge, which he entered with a Tancred Studentship. After obtaining the B.A. degree in 1876, he entered as a student at St. Bartholomew's; henceforth the Hospital became, perhaps, the dominant interest in his life. He became M.R.C.S. in 1880, and F.R.C.S. in 1884, and M.B. Cambridge in 1886. He was house surgeon to Mr. Willett at a time when there was no junior; it seems impossible that one man could have done the work of both, but it must be remembered that the number of operations at that time was small, there was only one operating theatre for four surgeons and four assistant surgeons, and there were only two operating days

in the week for them all. He afterwards became ophthalmic house surgeon under Henry Power and Bowater Vernon, and took up the eye as his line of practice.

After serving on the junior staff Jessop became demonstrator of anatomy, and remained in the rooms thirteen years till he came on the staff. It was during this time that he made his life-long friendships with his colleagues in the rooms like Bruce Clark and Lockwood, both of whom are now gone, as well as with successive generations of Bart's men who passed through his hands, many of whom lived with him in Harley Street.

Life at this time was a struggle. He had been elected surgeon to the Central London Ophthalmic Hospital and ophthalmic surgeon to the Paddington Green Hospital for Children, but his position at St. Bartholomew's was by no means secure; it needed courage and tenacity to weather the years of doubt and uncertainty. On the retirement of Mr. Power in 1894 Jessop was elected ophthalmic surgeon to St. Bartholomew's Hospital after a stoutly contested election carried on after the old methods, with a personal canvass of the whole body of Governors. His position then became secure, success followed and with it the sunnier side of his nature came out.

In his work at the hospital he stood by the traditions of the eye department. This had been founded in 1871, and a certain individuality of practice had been established there; thus it had been the custom to do the simple extraction of cataract without iridectomy; there were ways of doing things, methods of treatment, tricks of bandaging and the like, justified by experience, which gave the work of the eye wards at St. Bartholomew's a character of its own. Jessop not only kept to these methods, but maintained their superiority.

As a teacher he was not fluent, but his methods were appreciated; he had a bent towards sarcasm, but could be tolerant of fools. As a surgeon he rather followed the French school; he had received an austere training at Moorfields under Nettleship and others and had been through the mill; his methods of practice were sound. He had even made contact with the great founders of modern ophthalmology, and had sat at the feet of giants like Bowman and Donders.

As a writer he was not prolific, but some good work stands to his credit, notably his research into the action of cocaine when it was first brought in, and his Hunterian Lectures at the Royal College of Surgeons in 1887-8 on Anatomy and Physiology of the Intra-ocular Muscles; his other contributions were chiefly clinical. He was the author of a popular text-book for students which ran through two editions.

In 1915 Jessop reached the height of his ambition, and was elected President of the Ophthalmological Society of the United Kingdom.

To one of his greatest friends, Professor Straub, of Amsterdam, was due the suggestion that the time had come in this country for founding a really representative journal of ophthalmology. These views he embodied in a letter to Jessop in his capacity as President of the Society. With characteristic energy and foresight Jessop seized the suggestion; he wrote personally to most of the senior members of the Society suggesting the amalgamation of the existing British journals of ophthalmology, and called a meeting at his house in Harley Street to consider the proposal. The idea was approved and a sub-committee of seven was formed to draw up a scheme, and to make arrangements to amalgamate the existing journals, namely, *The Royal London Ophthalmic Hospital Reports*, *The Ophthalmic Review*, and *The Ophthalmoscope*. The sub-committee met on several occasions, and reported that a limited liability company should be formed to publish the new journal. The report was approved, and a general meeting of ophthalmologists was called at the house of the Royal Society of Medicine towards the end of September. Jessop, who was appointed managing director of the company, threw himself heart and soul into the onerous work of starting the journal. He lived long enough to see it successfully launched.

Jessop was a good friend and an honest one. He was at his best entertaining his colleagues; he contrived to throw together congenial spirits, and had the power of drawing out for the general good what was best in the way of anecdote or reminiscence among his friends. Who that heard it could ever forget the furious fun that arose when he succeeded in getting two guests to cap each other's tales about their experiences, the weaknesses of human nature, or the eccentric ways of some predecessor? As a story-teller his own method was peculiar; the barest framework of a story, an impressionist picture was outlined, with here and there a word, a half-sentence, a smile, or a significant silence.

His love of art was genuine and enthusiastic; his knowledge, judgment, and taste were good; his Whistler lithographs are famous; he loved to talk over his collections, or to tell the story of a rival who after offering large sums for a unique specimen, finally handed him a blank cheque to fill in as he liked in exchange for the picture: that cheque was not filled in.

On the Continent Jessop was almost the representative figure of British ophthalmology; he was a member of most of the foreign societies of ophthalmology; he assiduously attended all international congresses, and was generally present at the Paris and Heidelberg meetings; he was often voted to the chair, and had enough command of languages to fulfil the duties of the office. He had many friends among the Continental eye surgeons and was always glad to welcome them in his home in Harley Street or on

the river, where Mrs. Jessop received and entertained with kindly hospitality. Under his roof the guest was free to follow his own way, to join him in a morning swim in the river, or a hard spell of gardening. He lived the free life of the country whenever he could get away from his work, and took his full share as a country magistrate, and in other ways in the social life of his neighbourhood.

He lived a full life and will be greatly missed. Much sympathy will be felt for Mrs. Jessop and his daughter in their great loss.

W. T. HOLMES SPICER.

COMMUNICATIONS.

BITEMPORAL HEMIOPIA: THE LATER STAGES AND THE SPECIAL FEATURES OF THE SCOTOMA.

With an examination of current theories of the mechanism of production of the field defects.

BY

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IN a previous paper[51] it was shown how by means of serial test objects, following the method of Bjerrum and Rönne, it is possible to trace the development of the changes in the field of vision which are characteristic of bitemporal hemiopia. Originally thought to represent individual types, these changes were recognised some fifteen years ago by Josefson[30] as stages in a progressive process. The defect in the peripheral field nearly always becomes apparent first in the superior-temporal quadrant, which begins to fail from above downwards in a vertical direction. The lower-temporal quadrant is then invaded and becomes, as it were, scooped out from above, assuming a hook-shaped or uncinate form projecting from the lower-nasal quadrant outwards and upwards below and outside the blind spot. This projection shrinks gradually from without inwards until the temporal field ceases to exist, or, in many cases, the continued downward progress of the defect close to the outer side of the vertical meridian, not infrequently associated with an indentation from below, splits off the remains of the outer field forming a temporal island, which, in turn, gradually disappears, though it may remain to a relatively late period. The nasal field

now becomes encroached upon in its lower part, and the functional failure on this side progresses in an upward direction until at last the upper-nasal quadrant alone remains. At that time I wrote: "The loss occurs from above down in the temporal field, from below up in the nasal field and progresses round the fixation point clockwise in the right field and counter-clockwise in the left. In this respect the scotoma behaves in the same way as the general field." It is hardly necessary to mention that in atypical cases more irregular modes of development of the field defect are by no means infrequent. The results then obtained have been, for the most part, confirmed by Cushing and Walker,[9] who applied a similar method of examination to an extensive material, consisting, however, solely of tumour cases.

While general agreement prevails as to the main features of the fields there is still scope for investigation in regard to certain details such as:—1. The earliest stages; 2. The later stages; 3. The characteristic features of the scotoma; and 4. The mode of production of the field changes and their relation to the ætiology of the condition.

With regard to the earliest changes which our present means of examination enable us to detect it is somewhat difficult to collect much evidence, for most cases, up to the present time at any rate, are not encountered by the perimetrist at a very early stage. It is necessary to follow up suspected cases, it may be for years, to see whether they really develop into bitemporal hemiopia. During this period some are lost sight of, while in others the symptoms either disappear or fail to develop. These changes may be studied in cases (Cushing's Group III[7]) in which the constitutional symptoms are accompanied by minimal visual defects, only to be elicited by careful examination, as in early chronic acromegalies, whose fields are still so often described as being normal, or in cases in which the field of one eye is much less affected than that of the other.

In the paper already mentioned it was shown that at a very early stage, when alterations in the periphery of the fields are either undemonstrable or so indefinite as to be valueless, distinct changes may be found towards the centre within the 30° circle, an observation since confirmed by Walker[58] (see Fig. 27). It seems probable that in the initial stage the visual function over practically the whole of the upper-outer quadrant is to some extent depressed and that the earliest changes are to be found in the supracæcal region—above the blind spot. At some future time I hope to deal more fully with this part of the subject; the chief object of the present paper is to discuss the later stages of bitemporal hemiopia and the nature of the frequently associated scotoma.

By *later stages* are meant the stages of advancing blindness in the

nasal field, the earlier stages being those during which the temporal field is lost. That the latter fails from above downwards is generally accepted; there is, however, less agreement as to the precise mode of progress of the defect on the inner side. Some writers have found that the upper and some that the lower-nasal quadrant remains last. The literature shows few, if any, observations directed specially towards this point, and such evidence as there is, is frequently vague. Methods of perimetry capable of providing a detailed analysis of the field of vision have seldom been used, and, while the presence of bitemporal hemiopia has been often recorded, exact details as to the state of the fields are frequently omitted.

According to Wilbrand [63] an upper or lower-nasal quadrant or both upper-nasal quadrants may remain after the loss of the rest of the fields; at the time when he wrote (1897) he had found no reported case in which both lower-nasal quadrants alone remained. Bogatsch [5] collected thirty-four cases, in nine of which a late stage was present. In five, the remaining areas were said to be inwards; in one, down-in; and in three, up-in. Uhthoff,[54] who examined a large material, believes that a quadrant-shaped remnant in the nasal field, with vertical and horizontal boundaries, is diagnostic of chiasmal affection, even if the other eye is blind. He does not state whether the remnant is more frequently above or below, but the chart which illustrates the article shows retention of the upper-nasal quadrant, and of three fields used to illustrate hypophysis disease without acromegaly, two show upper-inner retention. In another paper,[55] of three cases described, one shows a late stage with upper-inner retention, and in his Bowman lecture,[56] two charts are given, one showing the greatest strength of the remaining field in the upper quadrant, the other the survival of a patch in the lower-nasal quadrant. Paukstat [40] describes three cases, all showing late stages, in one of which the remains occupied the upper-inner quadrants; the other two being neutral, that is, showing nasal hemiopic fields not differentiated into upper and lower quadrants. Of two advanced cases recorded by Rönne,[41] one had retention of the upper-inner quadrants with straight vertical and horizontal margins, the other was neutral. In Veasey's [57] case at one time the field of one eye had entirely disappeared, with the exception of the upper-nasal quadrant. Graham [24] has recorded two advanced cases, one showing retention of vision in the upper-inner quadrant, the other being neutral. In six cases, which the author attributed to a tabetic affection of the chiasma, Fuchs [19] found that the upper-nasal quadrants remained most frequently. One of the most important contributions to the subject is that of Hirsch.[29] His 26 cases include 23 bitemporal hemiopias of which 18 were in late stages. Four of these had definite retention of the upper-nasal quadrants

illustrated by charts; in one the field was said to be greatly contracted outwards and below. Case No. 12 in Hirsch's series is of especial interest in regard to this question. The diagnosis is said to have been very difficult, largely owing to the vagueness of the general symptoms, and the solution ultimately rested on the visual symptoms only. Both discs were quite white; the left eye could only see hand movements (it is not stated in what part of the field), and the right eye had vision equal to counting fingers at 4 metres, with the field reduced to the upper-nasal quadrant only. The opinion expressed by competent oculists was that *the characteristic field defects of hypophysis tumours were absent*. It was subsequently suggested that the preserved quadrant might be the remains of an earlier bitemporal hemiopia. After operation, during which a partly intrasellar tumour was found, the upper-inner quadrant of the left field returned and the lower-inner quadrant of the right field, producing a nasal hemiopic field on the right side. The way in which function returned helps to show that the retention of one or both upper-inner quadrants is a characteristic feature of bitemporal hemiopia; had the left field been accurately examined, the power to see hand movements would without doubt have been found in the upper-nasal quadrant. Retention of the lower-nasal quadrants was found in two cases, one of which, No. 7, presented the extremely rare condition in which both lower-nasal quadrants alone are preserved, a form of field anticipated, although not actually observed, by Wilbrand. The charts given of the eleven remaining cases, while showing nothing very definite in either direction, incline somewhat in favour of the up-in termination. In 1913 the subject of pituitary disease was discussed in the Royal Society of Medicine[45] and a number of cases were recorded, some eight of which show late stages. Six of these afford no information as to the relative strength of the upper or lower-nasal quadrants, in one the upper-nasal quadrant was preserved and in one the remains were rather more below than above the horizontal line.

On the other hand, Cushing[8] in 1913 found that the lower-nasal quadrant usually remained longest. In his book on the "Disorders of the Pituitary Body"[7] some 13 of the cases recorded have field charts showing advanced hemiopia and of these two show the remnants in the upper and two in the lower-nasal quadrant. In a later paper, specially devoted to bitemporal hemiopia in tumour cases, Cushing and Walker[9] maintain the same view, although here, again, the charts selected as illustrations show little evidence in favour of more frequent survival of the lower nasal quadrants. Of the 13 cases discussed 9 show late stages. One is an excellent example of retention of both upper-nasal quadrants—regarded by the authors as unusual—and another (case 8) showed relative strength of the upper-nasal quadrant before operation and survival of a patch mainly in the lower-nasal quad-

rant after two operations. Two other cases show survival of lower-nasal quadrants; while the remaining five give no definite indication in either direction. At the same time the authors state that after the loss of the temporal field the nasal field "begins to show contraction either above or below, but more often below." If the shrinkage of the nasal field usually begins from below and if its final remains are usually found in the lower-nasal quadrant, it is evident that a more rapid shrinkage must subsequently set in from above. Whether the authors have observed such a process is not mentioned, although one case (No. 8)—complicated, however, by operative interference—appears to support such a possibility. Walker [58] in a separate paper, although illustrated mainly by the same charts, does not refer specifically to this question, but in his scheme of the stages of bitemporal hemiopia shows the final area of vision mainly in the upper-nasal quadrant with its lower edge just crossed by the horizontal meridian. Sixteen cases are selected as examples, seven of which present late stages, one showing retention of both upper-nasal quadrants and one retention of part of one lower-nasal quadrant. Both of these cases are already figured in Cushing and Walker's paper, and the remaining five are neutral, so that as far as this particular detail is concerned, Walker's paper does not support Cushing's view. Kümmell [33] describes two cases, one in a late stage. Here the remains were in the lower-inner quadrant and the cause was an aneurism of the circle of Willis. Josefson [30] found the terminal areas in "the lower quarter of the visual field," but in the only communication to which I have had access does not give any illustrative cases.

Taken as a whole, the evidence from the literature, as far as I have been able to examine it, provides some 59 cases in advanced stages in which sufficient details of the condition of the fields are given either by charts or descriptions. Thirty-four show no definite indication as to whether the upper or the lower-nasal quadrant is retained. That the proportion of neutral cases is so large is evidently due to the fact that in few of these cases was the examination of the fields specially directed towards the elucidation of the latest stages, and possibly also to a slight extent to the presence of some in which the nasal fields were insufficiently affected to show any differentiation between the two quadrants, even had the examination been adequate. Of the remaining twenty-five cases seventeen show definite retention of the upper-inner quadrants, and only eight retention of the corresponding lower quadrants. A striking feature also is the fact that the margins of the retained portion, when this occurs above, frequently lie along the vertical and horizontal meridians of the field enclosing a definitely quadrant shaped area, while the remnant in the lower-nasal quadrant usually consists of a mere irregular patch. The conclusion would appear

to be that termination, or at least the attainment of the penultimate stages, is about twice as common in the upper-nasal quadrants as in the lower, the contrary view being supported almost solely by the statements of Cushing and Josefson.

With regard to the scotoma so frequently present in bitemporal hemiopia, a similar absence of special investigation is noticeable. The paracentral or centro-cæcal position of these scotomata, their quadrantic or hemiopic shape, and the way in which they vary in size or intensity, or enlarge in the temporal field, have been noted by several writers. Special attention was devoted to such scotomata by de Schweinitz and Holloway [48] in 1912, but they have not been generally studied with the same care as the field of vision as a whole. The only mention of the distinctive features of what may be called the chiasmal scotoma which I have been able to find, occurs in a paper by Rönne,[41] which is illustrated by charts showing the characteristic progression of the defect round the fixation point.

Method of Examination.—The method of examination is one which has been in use in the eye department of the Royal Infirmary of Edinburgh for some years, and was described by the writer as "The Quantitative Method of Perimetry." [53] Its essential feature is the use of a series of graduated test objects varying from 1·0 mm. or even 0·5 mm. up to 60 mm. or 70 mm. in diameter at distances of from 250 mm. to 2000 mm. or more. As the visual angle employed depends on the diameter of the test object and its distance from the eye, a wide range is obtained by this means.

Bjerrum's method was always used in the examination of scotomata and of the central field, for which it is essential, as without the large projection thus obtained thorough examination and analysis of defects within the 25° circle is impossible. The most useful test-objects are 5 mm. and 1 mm. with the ordinary perimeter, and 2 mm. and 1 mm. with Bjerrum's screen. Objects larger than 40 mm. are rarely required.

It will be convenient from this point onwards to refer to the upper-outer quadrant of the field as the first quadrant, the lower-outer

GUIDE TO FIGURES.

Coloured Plates.—Only white, red, and green test objects were used. Areas coloured red or green indicate the extent of the field for that colour with the object specified. Areas coloured orange or yellow indicate that a red object was thus described when seen in the area so coloured.

Text Figures.—Areas coloured black or grey indicate areas of total or partial blindness according to the depth of shading.

Fields for red, green, and blue are indicated by vertical, horizontal, and oblique shading respectively.

Each chart is marked with two scales of which one is stroked out. Those marked 1 mm. = 1° are on the large scale and show only the central part of the field out to 45°. Those marked 1 mm. = 2° show the field to 90°.

The fractions $\frac{5}{300}$, $\frac{1}{2000}$, etc., indicate that 5 mm. or 1 mm. was the size of the test object and 300 or 2000 mm. the distance of the eye from the fixation point respectively.

Where not otherwise specified the object used was white.

as the second, the lower-inner as the third, and the upper-inner as the fourth quadrant.

The clinical material now brought forward includes 22 cases of bitemporal hemiopia, and two of similar but less definite nature. They may be divided into the following groups:—

Group I.—Ten cases in the later stages.

II.—Six cases (five with scotomata) in relatively early stages but with features definitely bringing them into line with group I.

III.—Six cases with only early changes.

IV.—Two cases allied to, although not definitely, bitemporal hemiopia.

Group I. Ten cases in the later stages showing complete, or nearly complete, loss of the temporal field of one or both eyes to a medium-sized test object. Eight of these (Nos. IX, XII, XIV, XV, XVIII, XIX, XXIII, XXIV) showed retention of the fourth quadrants, in one (No. X) this sign was not looked for, and in one (No. XXI) it could not be elicited. This is the only advanced case in which differentiation of the nasal quadrants was looked for and not found in one field at least.

Group II. These six cases (Nos. I, III, V, VII, XI, XXII), although showing relatively early changes in the peripheral fields, had characteristic typical features, in five in association with scotomata, in the sixth (No. V) in the colour fields. They all showed relative retention of the fourth quadrants.

Group III. Five were cases of chronic acromegaly (Nos. II, IV, VI, VIII, XIII). The sixth (No. XVI) was probably due either to tumour or to syphilis. This was the only case with a scotoma in which differentiation of the nasal field into upper and lower quadrants was not demonstrable. The field changes were all early and these cases therefore do not fall within the scope of this paper, but have been included for the sake of completeness.

Thus of sixteen cases of bitemporal hemiopia (Groups I and II) which showed well-developed defects either central or peripheral, or both, fourteen showed the typical clockwise and counter-clockwise progress of the defect in the right and left fields respectively with relative retention of the superior-nasal quadrants.

Group IV. Two other cases, with field changes evidently closely allied to, if not actually, bitemporal hemiopia, showed similar features.

These eighteen cases (Groups I, II, and IV) have been selected for more detailed examination.

The changes in the peripheral field are illustrated by Cases III, IX, XII, XIV, XV, XVIII, and XXIV. All stages are shown from the early depression of the upper-outer margin (Plate I, Figs. 1, 6; Fig. 7) to the stage at which the fourth quadrant alone remains (Figs. 15, 25). Plate II, Fig. 3, shows a very early stage requiring

PLATE I.

FIG. 2.

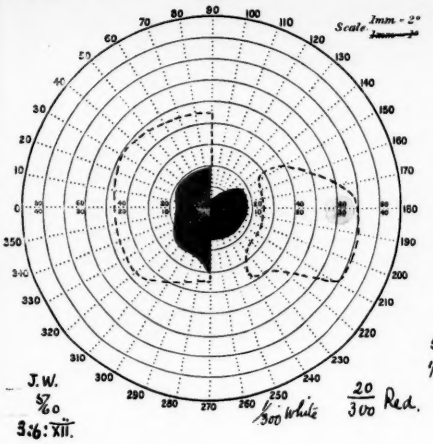


FIG. 1.

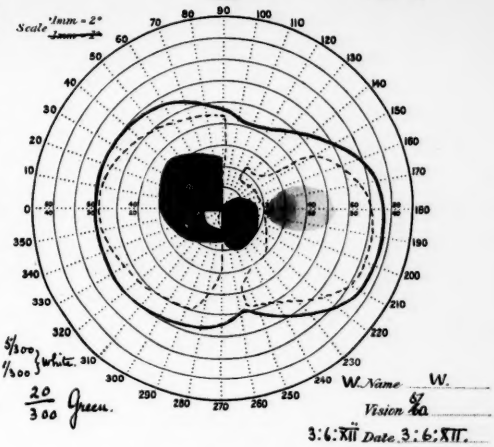


FIG. 4.

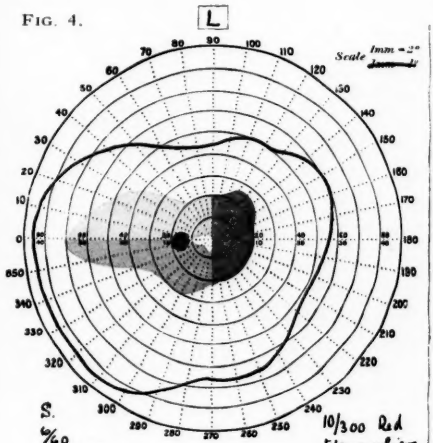


FIG. 3.

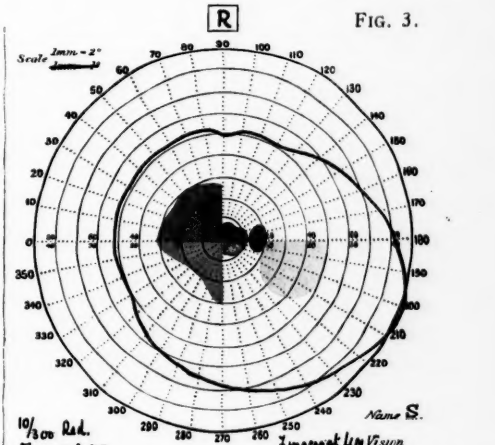


FIG. 6.

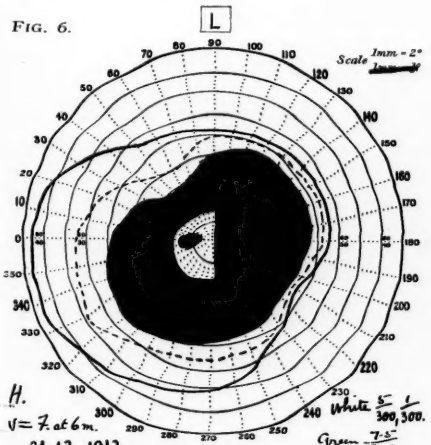
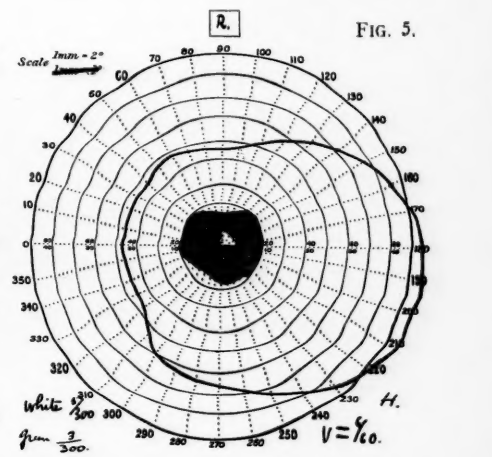


FIG. 5.



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Bjerrum's screen and very small test objects for its demonstration. In several cases where the nasal field was still practically intact, the relatively greater retention of function in the fourth quadrant was brought out by the use of coloured or sufficiently small white objects (Plate I, Fig. 3; Figs. 11, 12, 14, etc.). Case III (Plate I, Figs. 3 and 4) is particularly illustrative, as although the peripheries of the fields for a 5 mm. white object were practically unaffected, a test with coloured or small white objects showed the whole series of perimetric changes at the same time. All the cases show the typical changes at one stage or another, but the complete perimetric picture is not often met with at any one date in the history of a case. Case XVIII is of interest in that the fourth quadrant alone is retained in the left field (Fig. 20), while only very early defects are detectable in the right. As the vision and fundus were normal, and the field full to ordinary tests, the right eye might easily have passed as quite unaffected. Careful examination with Bjerrum's screen, however, showed slight temporal contraction within the 30° circle, and a more distinct temporal loss for red (Plate II, Fig. 3), changes which, although apparently trifling, are not to be disregarded, as I have observed exactly similar changes in cases in which typical bitemporal hemiopia subsequently developed. Considering the two fields together, it seems justifiable to class this case as a bitemporal hemiopia. Retention of the upper-inner quadrant with the final stage—blindness—in the other eye is mentioned by Uhthoff [51] as diagnostic of bitemporal hemiopia, but, so far, I have not seen other descriptions of cases in which the field of the second eye showed only the earliest changes.

In the central part of the field two types of defect occur, either separately or together. The non-scotomatous type consists usually in an upper-outer or outer flattening or indentation of the central isopters. It is demonstrated by reducing the size of the test-object, coloured if necessary, until the resulting field extends only a few degrees from the fixation point. It is then frequently found that only the fourth quadrant remains, Figs. 11, 14; Plate II, Fig. 6. This type differs from the scotomatous type in that the defective area is not surrounded by an area of relatively stronger function. It is really a defect of the peripheral type which can only be shown by a very small object necessitating a very small and central field. Its presence seems to show that the lower-nasal field, although apparently normal, is really slightly affected right up to the fixation point. Where there is a scotoma on the temporal side, as in Plate II, Figs. 2, 4, it might be suggested that the absence of the small third quadrant for red is due to a true scotomatous defect of slight intensity in that area of practically equal extent. In Plate II, Fig. 2, the red test object appears as yellow in the apex of the third quadrant, and if the above explanation were valid, the yellow area

should be surrounded by a red band of some five degrees in width. Plate I, Fig. 1, for example, shows a true scotomatous defect of the apex of the third quadrant for green with a band of preserved field between the scotoma and the periphery.

The second type of central defect is the scotoma. Figs. 1, 2, 3, 4, 5, and Plates I and II, show its various stages. It behaves like a small field within the field, being most dense in the first quadrant where it makes its appearance, and becoming progressively less dense in the second, third, and fourth quadrant. Plate I, Fig. 2, shows an interesting stage. In the temporal field the scotoma affects the apices of both quadrants, being practically absolute in both. On the nasal side there is a relative hemiopic scotoma for red, which is seen as yellow in the lower and as orange in the upper part, illustrating the relative preservation of the fourth quadrant. Figs. 3 and 4 illustrate the changes in the scotoma in the right field of Case III during six days on a larger scale, and show how closely the development of the scotoma follows that of the field as a whole. Figs. 2 and 4, Plate II, show good examples of cases in which both types of central change occur together, the scotomatous type occupying the temporal side of the vertical meridian. Such cases are of interest as showing that the scotoma may sometimes be preceded by a defect of peripheral type and less intensive nature, suggesting that not only the central fibres, but practically the whole chiasma, is affected.

In the twenty-two cases of bitemporal hemiopia scotomata could be demonstrated in ten, five of which showed what have been described as typical characteristics. Of the remaining five, one (Case IX) had a half-ring scotoma (Fig. 8). Case XV showed a very atypical scotoma, and the course of the peripheral field was also somewhat irregular. Case XVI had oval centro-cæcal scotomata which could not be satisfactorily differentiated into upper and lower quadrants, and in Cases XII and XIX the scotomata were so dense that analysis was impossible. Only the first two can be regarded as valid exceptions to the rule, as the two latter were either too little or too much developed to permit of their nature being ascertained. Such exceptions suggest no alternative type, but merely that, as is to be expected, deviation from the type may occur.

Relative retention of function in the fourth quadrants may be regarded as the typical penultimate stage in the normal progress of bitemporal hemiopia. In the cases described in this paper this sign has only been recorded as definitely present when it could be satisfactorily and consistently demonstrated and confirmed by a variety of tests. In several of the cases the sign was at times somewhat indefinite; it would be found and then again prove incapable of confirmation with another test. In Case XXIII; for instance, it was quite definitely present at one time for objects equal to $\frac{15}{2000}$ green

PLATE II.

Fig. 2.

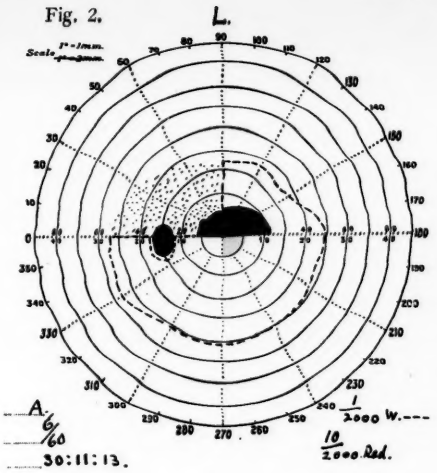


Fig. 1.

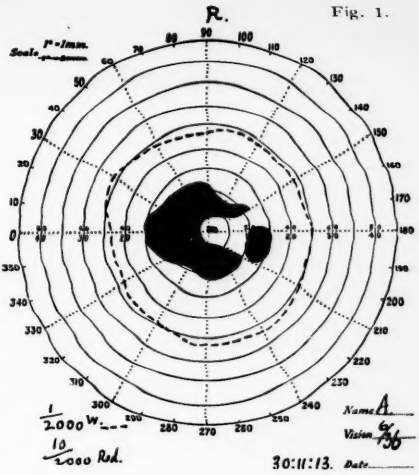


Fig. 4.

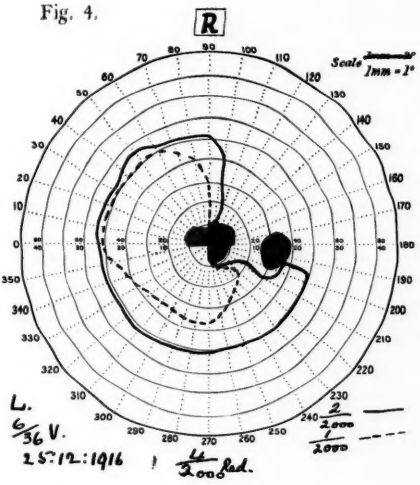


Fig. 3.

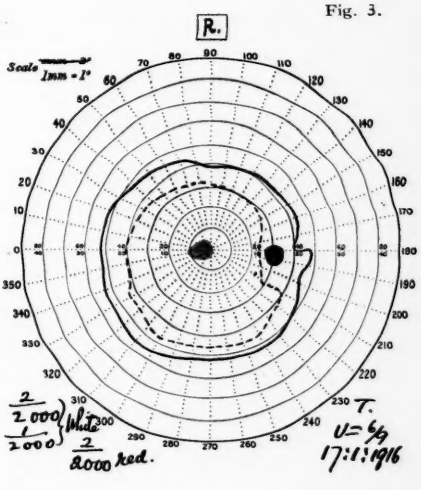


Fig. 5.

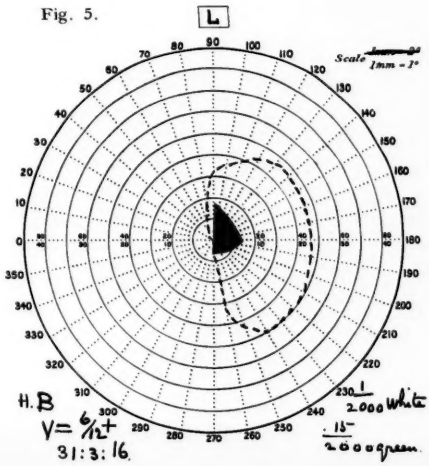
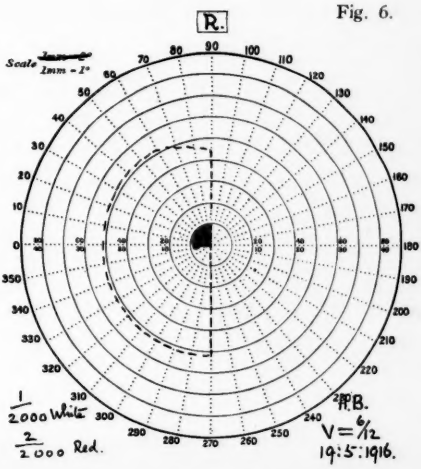


Fig. 6.



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and $\frac{2}{2000}$ red but became less distinct when the patient's condition and some of the eye symptoms, central vision, nystagmus, etc., had improved, although the defect in other parts of the fields had progressed. In such cases, where the relative superiority of the fourth quadrants is not very pronounced, but is, so to say, hovering on the threshold determined by the lesion, on the one hand, and our methods of examination and the patient's ability to respond to them, on the other, it is only to be expected that such a symptom should be somewhat inconstant and variable. The fact that its presence varies with the other symptoms, indicates that it is a definite response to the activity of the lesion.

Cases.

CASE I.*—J. W., female, age 31 years, under the care of Dr. Mackay. Seen April, 1912, complaining of bad sight. Obvious acromegaly was present which had been slowly progressing for four years, but more rapidly during the last nine months. R.V.=6/60, optic disc pale; L.V.=6/12, disc normal. Typical bitemporal hemiopia with well-marked splitting of the fields of vision and temporal islands. Plate I, Fig. 1 shows field of right eye on June 3rd, 1912. There is a large centro-cæcal scotoma with straight mesial edge. While the field for 5/300 white is little altered, that for 1/300 is vertically split in the typical way. The field for 20/300 green shows on the temporal side a horizontally oval island rather stronger centralwards. On the nasal side this test gives a peculiar hemiopic field; the upper quadrant is much larger than the lower and the apex of the latter is absent, being occupied by a clean-cut quadrant scotoma. Thus, the central loss for green is progressing clockwise and has affected three quadrants, the peripheral loss proceeding more slowly. The scotoma for 1/300 white is also seen to be slightly encroaching upon the apex of the lower-inner quadrant from the outside. The process is further illustrated by Plate I, Fig. 2, which shows the field for red 20/300 in the same eye taken at the same time. The temporal island is very weak and approximately indicates the position of a "glimpse" of red colour. The nasal field for red shows a hemiopic scotoma which resolves itself into two quadrant scotomata corresponding respectively to the apices of the lower and upper-nasal quadrants. In the lower apex red appears as yellow; in the upper as orange. Ordinary red colour, when passed from an area of greater to one of lesser defect, often appears first as a grey or whitish, then as yellow and orange successively before it is recognised as red. Similar conditions occur in other forms of loss of conductivity of the visual fibres.

Thus, the central defect is here advancing from below upwards. The field for white 1/300 was taken nearly three weeks later than that in Fig. 1 (Plate I), and shows further advance. In this particular case the condition shown represents the most advanced stage reached, as at this point the patient became very ill, completely lost the sight of the right eye, and then recovered with left homonymous hemiopia. She was in very good health

*(51) Case I.

when last seen, July, 1916, vision being R. counting fingers close to face on temporal side only; L. 6/6. Acromegaly stationary.

CASE II.—C. R., June, 1912. Chronic acromegaly (See (1) Case V.) Fields in early stages only.

CASE III.*—Mrs. S., age 30 years. Seen August 7th, 1912. History of dimness of sight following a bad headache two weeks previously. Was subject to "bilious attacks." Acute suppuration of right maxillary antrum; sella Turcica normal. Relative bitemporal hemiopia with scotomata. R.V. = 6/36, L.V. = 6/24; optic discs normal. On August 11th, R.V.=counting fingers at 4 meters, L.V.= 6/60. Plate I, Figs. 3 and 4, show fields at this date. The peripheries for 5/300 white are practically normal; in the right field is a hemiopic scotoma composed of a dense upper and a less dense lower portion corresponding respectively to the apices of the upper and lower temporal quadrants. The right field for 10/300 red is characteristically split through the centro-cæcal area, a weak temporal is landremaining in the lower-outer quadrant. Colour vision for a 10 mm. red object is thus absent in the first, and weak in the second quadrant, rather stronger in the third, and normal in the fourth quadrant. The left field, Plate I, Fig. 4,

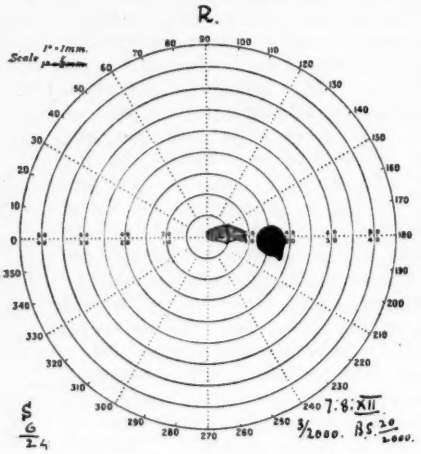

FIG. 1.

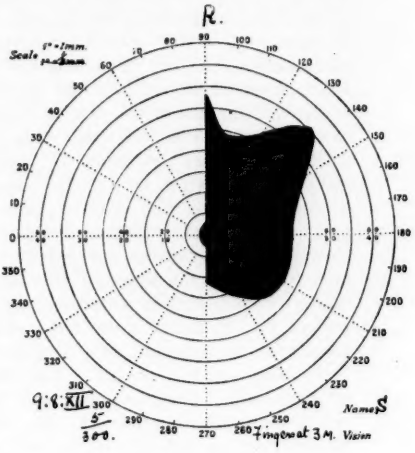

FIG. 2.

shows a similar, though less advanced, condition. There is still weak colour perception in the first quadrant and the two quadrants on the nasal side are as yet of equal strength. A temporal hemiopic centro-cæcal relative colour scotoma is present in which the colour was not perceived in the upper part and only very faintly in the lower.

The colours in Figs. 3 and 4, Plate I, are intended to show only the gradation in which red was perceived and not the exact tints seen as these became more tinged with orange or yellow as the redness diminished.

*(51) Case II.

This case illustrates extremely well the regular progression of the field defect round the fixation point, clockwise in the right field and counter-clockwise in the left, and the similar nature of the scotoma which behaves like a small field within the field. See Figs. 1 to 5, showing scotoma on different dates.

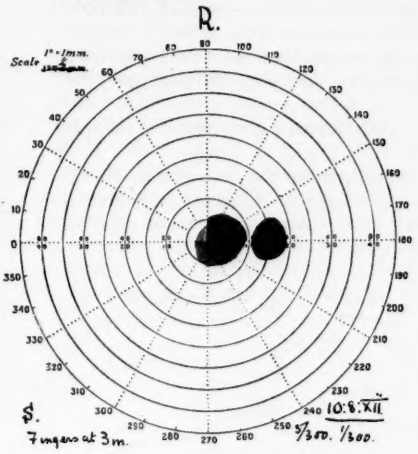

FIG. 3.

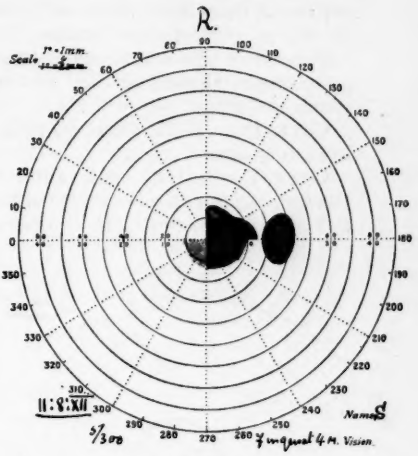

FIG. 4.

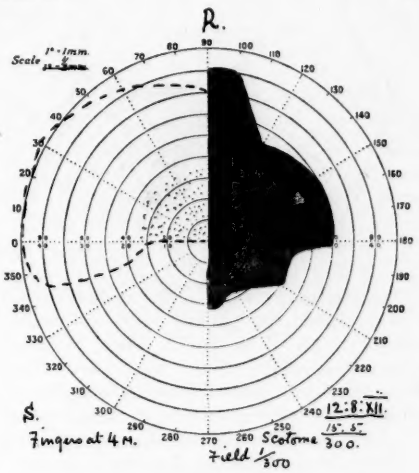

FIG. 5.

The interrupted line indicates the *field* for 1/300 white. This object was only dimly seen in the dotted area.

By the end of August, 1912, there was definite pallor of both optic discs; nevertheless vision improved. When last seen in August, 1915,

R.V.=6/12+, L.V.= 6/12; pallor of both discs. By Bjerrum's method and by colour testing, evidence of bitemporal hemiopia resembling early stages could still be obtained.

In this case had delicate tests not been employed, the bitemporal hemiopia might have been completely missed. At the same time peripheral defects for the usual 5/300 white test were absent, an instance of Rönne's "disproportionality." This indicates the activity of the lesion, which was undoubtedly a chiasmal retrobulbar neuritis, possibly of oxic origin, depending on the suppurating antrum, or perhaps the sphenoidal cells.

CASE IV.—T. C., October, 1912. Early chronic acromegaly. Fields in early stages.

CASE V.—A. H., female, age 33 years. Under the care of Dr. R. H. Blaikie. Seen November, 1912. Acromegaly, duration 13 years. R.V. (corrected) 6/9. L.V. (corrected) 6/9. Optic discs show relative

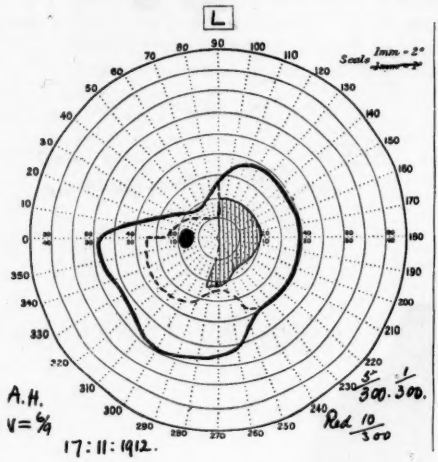

FIG. 7.

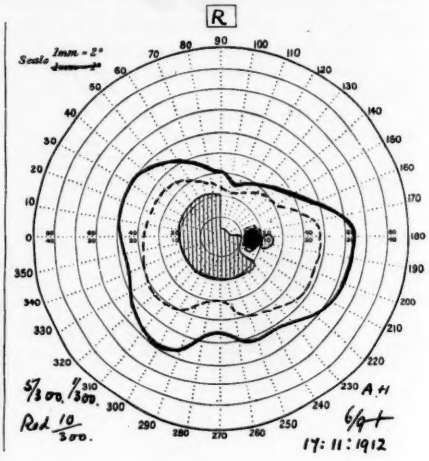

FIG. 6.

pallor more marked on left side. The ordinary outward signs of acromegaly are well marked, but patient is in good health, and works as a laundress. Fields of vision: Figs. 6, 7. There is flattening of the first quadrant on each side, especially on the left, where the first quadrant of the field for 1/300 white has almost entirely disappeared. Red 10/300 gives bitemporal hemiopia, with retention of a narrow mesial strip of the second quadrant on the left side, and of the major portion of the second quadrant on the right side. On each side, red is called "bright red" in the fourth quadrant, "not so bright" in the third quadrant, "yellowish" in the second, and "yellow" in the first quadrant. It was, however, not possible to chart exact boundaries in this case for these quadrants.

CASE VI.—Miss B., age 54 years. Chronic acromegaly. Fields in early stages (See Fig. 28).

CASE VII.—W. D. H., age 39 years. Seen December, 1912, under the care of Dr. Mackay. History of sudden loss of vision eight months previously. No nasal disease or venereal trouble. Is very healthy except for eyesight. For the last six months vision has got no worse. R.V.=6/60. L.V.=counting fingers at 6 metres. Optic discs show partial atrophy suggesting in its appearance a previous neuritis. Fields: Plate I. Figs. 5, 6. Peripheries for 5/300 white are practically normal. Right field for green 3/300 shows a small scotoma corresponding to the apex of the upper outer quadrant. The periphery of the left field for 1/300 white shows an upper outer shallow depression and a scotoma in the centro-cæcal area. The left field for green $\frac{7 \cdot 5}{300}$ shows this depression considerably accentuated while the scotoma is more fully developed, being hemiopic in form and embracing the central portions of both upper and lower temporal quadrants. Although there was no suggestion of toxic amblyopia, stoppage of tobacco was followed by improvement in a month to R.V. 6/24+. L.V. 6/60. These fields illustrate the growth of the scotoma in advance of the peripheral defect, both being of the same type. Probably some form of chiasmal retrobulbar neuritis has been the original cause.

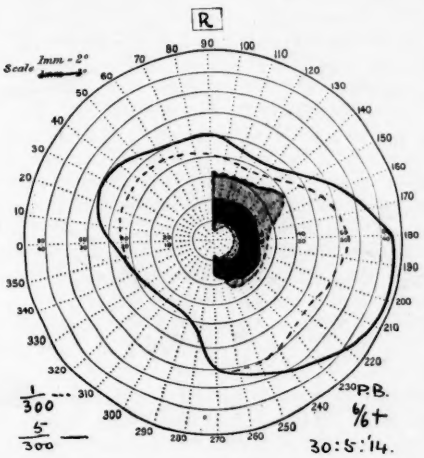

FIG. 8.

The ordinary centro-cæcal scotoma of tobacco amblyopia is not divisible into quadrants by analysis with serial test objects whether white or coloured, but shows one or two foci of greater intensity.

CASE VIII.—Mrs. D., age 60 years. Chronic acromegaly. Early fields.

CASE IX.—P. B., age 24 years. Seen March, 1913, under the care of Professor Gulland. Well-marked progressive acromegaly. At this time only very early changes in the central fields were detectable. Vision=6/4·5 in each eye. Right optic disc normal, left showed very

faint relative pallor. Sella Turcica enlarged. The fields developed typically with the exception of the scotoma which became a hemiopic temporal ring scotoma, Fig. 8. Figs. 9 and 10 show fields in March, 1916, taken by Bjerrum's method, illustrating relative retention of the fourth quadrants.

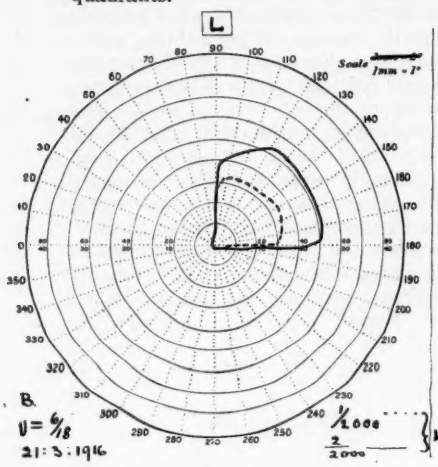

FIG. 10.

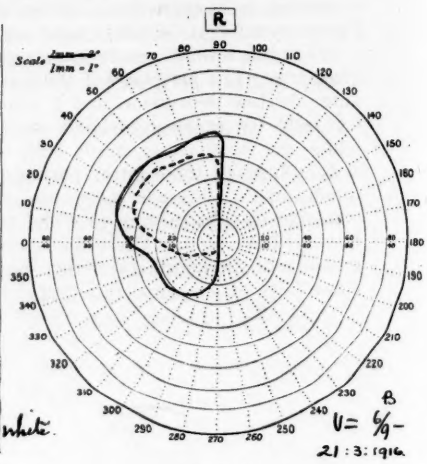

FIG. 9.

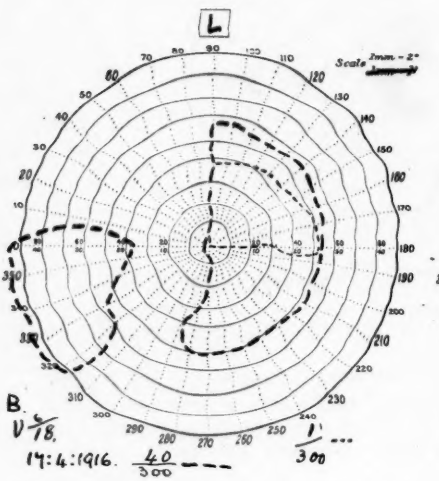

FIG. 12.

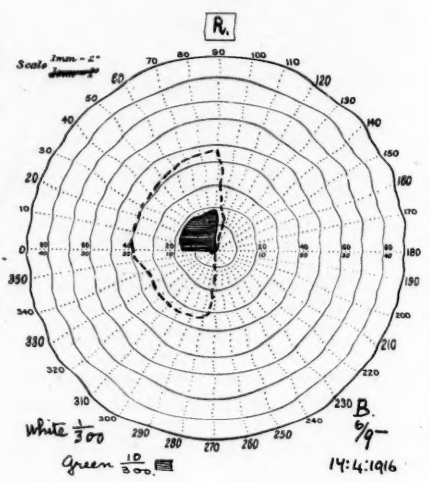

FIG. 11.

At this time R.V.=6/9 part. L.V.=6/18. Some pallor of optic discs, especially the left. At the end of March an operation was performed by

Col. Caird, about a drachm of soft material being removed from the sella. Central vision remained the same, while the remains of the temporal fields became still more reduced. The patient's general condition, however, improved somewhat, and about six weeks after the operation a slight increase in the lower temporal fields occurred. When last heard from in November, 1916, he stated that his sight was no better.

Figs. 11, 12, show fields taken in April, 1916, after the operation.

CASE X.—D. M., male, age 45 years. Under the care of Professor Gulland. Seen October, 1913. R.V. = no perception of light; optic atrophy. L.V. = 6/12, disc pale. Field of vision: complete temporal hemiopia for 20/300 white. Smaller objects down to 1/300 white show commencing shrinkage of lower nasal quadrant. A minute analysis of the nasal half field was not undertaken. The patient died in December, 1913. A large and very soft pituitary tumour extending upwards into the brain was found. The shrinkage of the lower nasal quadrant found suggests that the upper nasal quadrant was relatively the stronger.

CASE XI.—J. A., male, aged 47 years. Seen November, 1913. History of gradual loss of sight for last five or six months, more rapid recently. Corrected vision: R. 6/60. L. 6/60 +. *Slight pallor of right optic disc.* Plate II, Fig. 1, shows field of R.E. by Bjerrum's method. Boundary for white 1/2000 practically normal; *a small scotoma with straight vertical* and horizontal inner and lower margins occupied the apex of the upper-outer quadrant. For red 10/2000 there is a large centro-cæcal defect. The left field (Plate II, Fig. 2) for 1/2000 white is very weak in its upper-outer quadrant (dotted area) and a similar, but larger scotoma is present Red 10/2000 is only detected in the apex of the upper-inner quadrant, in the corresponding part of the lower-inner quadrant it appears yellow, and colourless in the apex of the lower outer quadrant. No other symptoms were present; the peripheral field of the left eye was normal, right not examined. This patient was a poorhouse inmate, and was *not seen again.* Here the lesion apparently affected mainly the more central fibres in the chiasma. The similarity between *Figs. 2 and 4, Plate II,* is very striking. *See also Figs. 3, 4 and 5.*

CASE XII.—J. M., male, age 43 years. Seen November, 1913. *Under the care of Dr. Paterson.* History of severe headaches for five or six years, which ceased about September, 1913. Gradual loss of sight occurred, which became more marked about a month before the cessation of the headaches. During the last five weeks he thought his sight had been a little better. R.V.=hand movements before face. L.V.=6/18, optic discs slightly pale. Skiagraphic and rhinoscopic examination negative. Figs. 13, 14, show fields taken in January, 1914. *Relative* retention of fourth quadrant marked in each field, more especially the right. A larger test object showed the remains of the temporal field on the left side, with a scotoma upwards and inwards from the blind spot. Potassium iodide and mercury were ordered, and in June, 1915, patient was reported to be back at work and in good health. He could not be persuaded to return for further examination. Probably syphilitic lesion.

CASE XIII.—Mrs. G., age 29 years. Seen May, 1915, under the care of Dr. Boyd. Commencing acromegaly. Very early field changes only.

CASE XIV.—W. A., male, age 65 years. Seen June, 1915, under the care of Dr. Paterson. Loss of sight "at sides" had been noticed for 10 to 12 years. Headache had been present for six months, just at present better. R.V.=6/36. L.V.=6/12. Both discs show incipient atrophy.

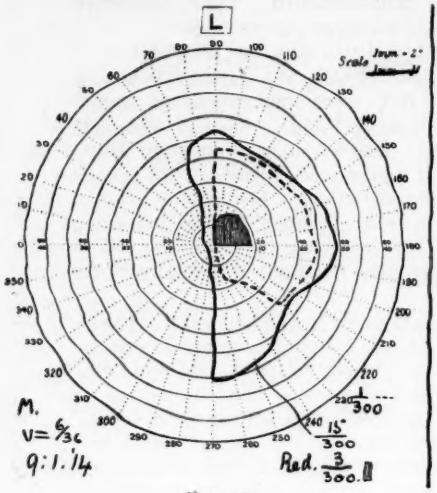

FIG. 14.

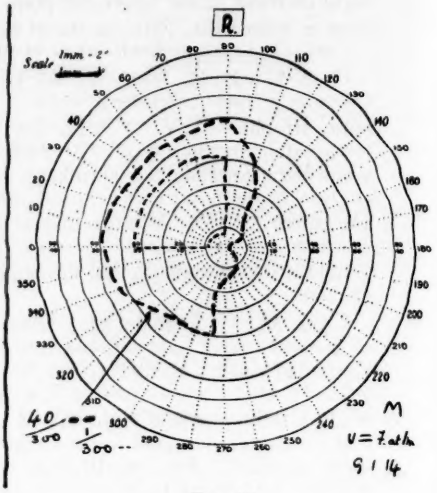

FIG. 13.

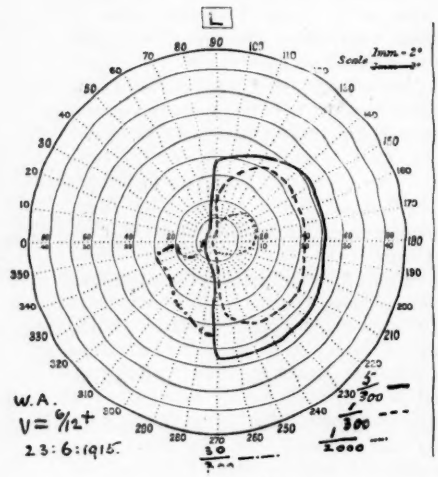

FIG. 16.

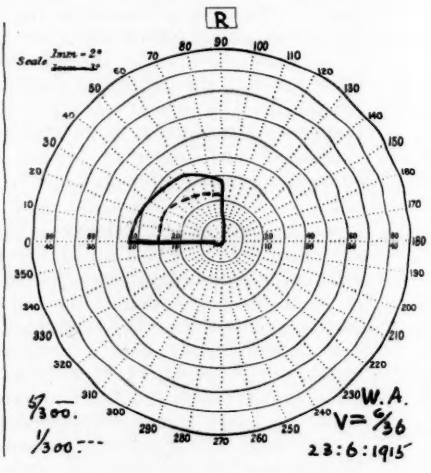

FIG. 15.

Neurological examination negative. Fig. 15 gives the field of the right eye for 5/300 and 1/300 white, showing clean-cut retention of the fourth quadrant, slightly larger for the larger object. The left field, Fig. 16,

showed an undifferentiated nasal half field for 5/300 white, to which a portion of the lower-outer quadrant could be added by 30/300 white, forming a hook-shaped outline indicating the previous presence of a scotoma. Last seen in July, 1916. The condition of the fields is much as before, but now small white and coloured objects are, in the left field, only recognised in the fourth quadrant, *i.e.*, this field is now differentiated into a stronger upper and weaker lower nasal quadrant. A skiagram shows great enlargement of sella with absorption of dorsum sellæ.

CASE XV.—W., male, aged 53 years. Seen July, 1915, under the care of Dr. Mackay. History of progressive dimness of sight for six months. No other symptoms excepting an occasional feeling of "fulness" in the head and a tendency to drowsiness. In July, 1915,

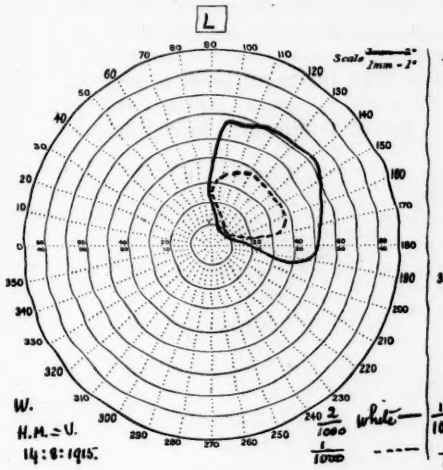

FIG. 18.

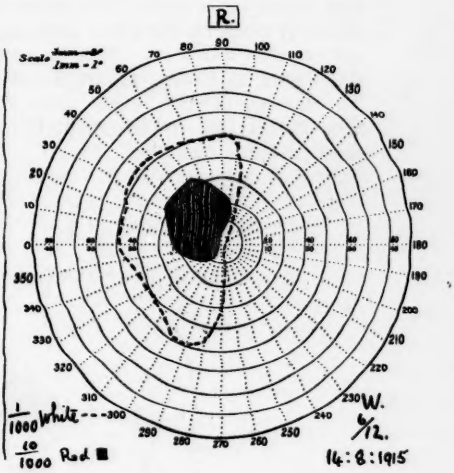

FIG. 17.

R.V.=6/9+ ; L.V.=6/60. Optic discs normal. Some old choroiditis in left eye. Skiagram shows erosion of clinoid processes and great flattening of sella Turcica. The fields of vision showed characteristic bitemporal hemiopia, but with somewhat atypical scotomata. Figs. 17, 18 show the fields in August, 1915, by Bjerrum's method, when R.V.= 6/12, and L.V. = hand movements in upper-inner field. Mercury and iodide, and thyroid were tried without benefit. In September, 1915, the nasal field of the left eye disappeared, while the temporal field was partially restored, the condition having changed to a modified right homonymous hemiopia. The right field also improved slightly, still retaining its greatest strength in the upper-inner quadrant. Since the fields became homonymous, the condition has remained practically stationary. In June, 1916, there was definite pallor of both optic discs, especially the left, and R.V.=6/12+, L.V.=hand movements best seen down out. Probably a tumour in this case, now well out of the sella.

CASE XVI.—J. R. J., male, age 36 years. Seen August, 1915, under

the care of Dr. Mackay. History of dimness of sight beginning very gradually eighteen months or two years ago. About a year ago he began to feel "unfit," and during July, 1915, his sight got worse. Now R.V.= 6/18, L.V.=6/6. Discs normal. No other symptoms. Skiagram shows enlargement of sella with erosion of clinoids. The fields of vision showed bilateral centro-cæcal scotomata, loss of the upper-outer quadrants for fairly large objects and complete bitemporal hemiopia for small objects. Differentiation into upper and lower-nasal quadrants was absent. Although there was nothing definite in the history and a Wassermann examination was negative, mercury and iodide were tried in view of the possibility of syphilis. Judging by his letters this treatment was beneficial, at least at first: his last letter, written in November, 1916, suggests some doubts. Cope[6] quotes a case in which he considers that enlargement of the sella was caused by syphilitic periostitis. This case has been included among the early cases as the lower temporal fields were retained excepting for very small test-objects. The X-rays suggest tumour, although the patient's statements as to his improved vision after treatment point to syphilis. The absence of other symptoms is no contra-indication of tumour and the slowness of real improvement is in favour of tumour, which seems the most probable diagnosis.

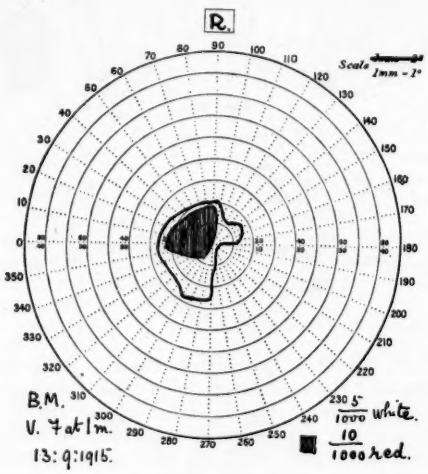

FIG. 19.

CASE XVII.—B. M., female, age 20 years. Seen September, 1915, under the care of Dr. Logan Turner. History of gradual loss of vision without other symptoms. R.V.=counting fingers at one metre; L.V. nil. Both discs show post-neuritic optic atrophy. Rhinoscopy and skiagraphy negative. Fig. 19 shows fields of right eye for 5/1000 white and 10/1000 red with retention of upper-inner quadrant. Here again the cause is unknown and is evidently transient. It is, of course, not quite certain whether this is a case of true bitemporal hemiopia, but the total loss of

sight in one eye together with the temporal loss in the other with relative retention of the fourth quadrant show that it is at least closely allied to that condition.

CASE XVIII. Mrs. R. T., aged 46 years. Seen September, 1915, under the care of Dr. Paterson. History of failing vision in the left eye more rapid during the last year. The sense of smell is poor and there is some deafness, otherwise patient is in good health. Skiagraphy negative. R.V. c.−1 D. sph.=6/9; optic disc normal. L.V.=counting fingers at 2 feet; disc pale. Fig. 20 shows field of left eye, very little extension being obtained by an object as large as 40/300. Plate II, Fig. 3, gives the field of the right eye by Bjerrum's method, showing very early signs of temporal hemiopia as indicated by the shrinkage on the temporal side, especially above, and the temporal loss for red. In this case also the exact cause is doubtful.

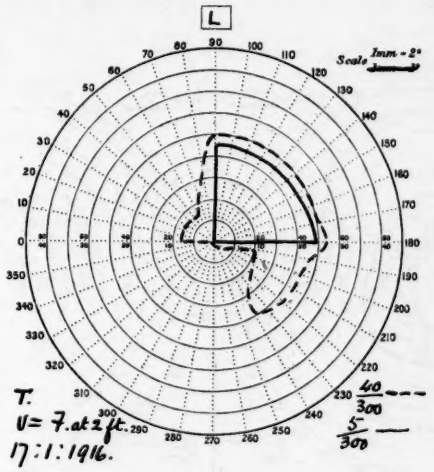

FIG. 20.

CASE XIX.—A. S., male, age 20 years. Seen September, 1915, under the care of Dr. Flett. History of tuberculosis of cervical vertebræ, with paralysis of lower limbs, which lasted for about three years. Then deafness for about four months, and about the same time dimness of vision was noticed. When seen, R.V. and L.V.=hand movements on nasal side. Advanced optic atrophy. Bi-temporal hemiopia, with large central defects, giving fields a somewhat crescentic shape. Skiagraphic and rhinoscopic examination negative. Figs. 21, 22, show fields by Bjerrum's method at 1,000 mm. The small white object was much better seen above, and red 70/300 was recognised in the upper inner quadrants only. When seen in January, 1916, the blindness was worse, if anything. In this case one must assume that there is, or has been, a tuberculous lesion of, or near, the chiasma.

CASE XX.—E. K., female, age 26 years. Seen October, 1915, under

the care of Dr. Logan Turner. History of syphilis contracted in 1906, and treated with salvarsan. Dimness of vision came on shortly afterwards, but apparently disappeared later. In May, 1914, left eye became painful and watery, and a gumma developed on nose. About the end of August, 1915, there were very severe headaches, with much pain in the eyes, and the left eye rapidly became blind. When seen, R.V. c.—3D. sph.=6/60. L.V.=nil. Optic discs normal. Severe headache; pain on pressing eyeballs back especially on the left side. Field of vision, Fig. 23, shows much enlarged blind spot with relative retention of upper-inner quadrant. The blindness of the left eye, together with the state of the right eye, seemed to justify the inclusion of this case as one of probable bitemporal hemiopia, or at least a very closely allied condition. There was a large perforation in the nasal septum, and a skiagram showed relative dullness of left and right ethmoidal cells and of left antrum.

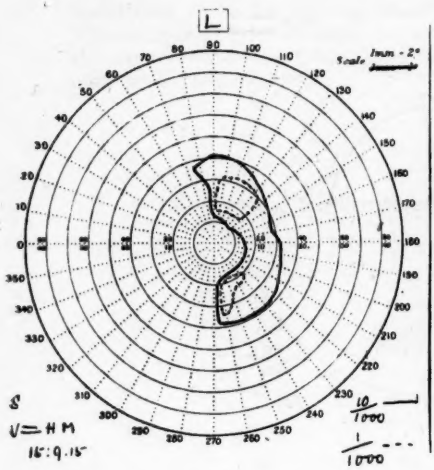

FIG. 22.

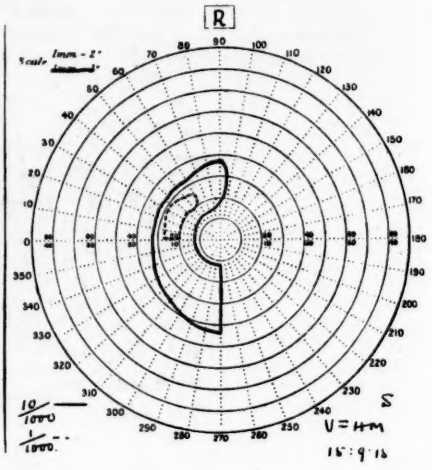

FIG. 21.

In November, 1915, there was still no vision in the left eye, but the right had improved to 6/12.

In July, 1916, patient was admitted to the Infirmary under the charge of Dr. Rainy. She had been ill and had bad headaches again. R.V. (corrected) =6/12. L.V.=counting fingers at one metre in the upper inner quadrant. The right optic disc is a little pale, the left markedly so. Fields of vision now show only a little contraction on the right side and the upper inner quadrant only on the left side. Fig. 24. The sight began to return to the left eye in November, 1915. It is to be noted that the left eye was totally blind for about three months and then recovered its upper inner quadrant. Probably the cause was a basal syphilitic periostitis.

October, 1916. R.V. (corrected)=6/6−; L.V.=counting fingers in upper-inner quadrant. Fields practically as in July.

CASE XXI.—N. D., female, age 26 years, under the care of Dr. Mackay. Seen November, 1915. History of slow failure of vision for about a year. In September, 1915, patient was unable to read but sight then improved somewhat. R.V.=6/18−, L.V.=6/18. The right disc was slightly pale, the left distinctly atrophic. The fields show complete bitemporal hemiopia, a test as large as $\frac{50}{250}$ white not being seen in the temporal field of either eye. There was no differentiation into third and fourth quadrants either for white or colour, and no scotoma was present in the nasal fields. Skiagraphy showed slight enlargement of the sella. Thyroid treatment was instituted.

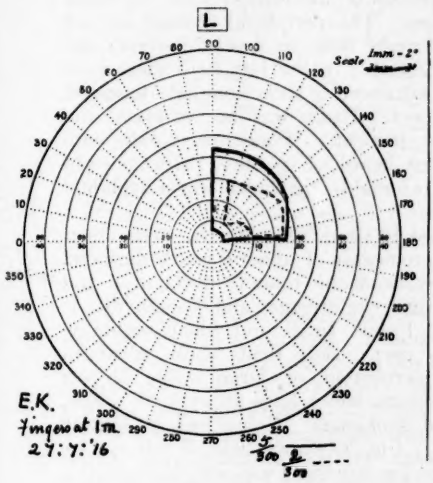

FIG. 24.

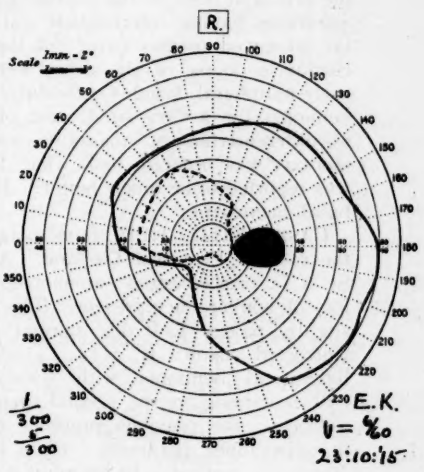

FIG. 23.

In August, 1917, patient was reported quite well and at work since January. She was seen again on August 28th. She felt well but her features seemed a little coarsened. R.V.=6/5−, disc pale. L.V.=6/24, disc pale and atrophic, eye diverges and does not fix well. Menstruation still absent. Fields show no alteration of note. In spite of the patient's feelings the conditions present show no real improvement. This is the only one of the ten advanced cases in which the nasal field could not be divided into upper and lower quadrants by serial test-objects. The absence of menstruation and the appearance of the features lead one to suspect tumour, probably pituitary. The rather doubtful X-ray examination would not exclude an early infundibular enlargement.

CASE XXII.—K. P. L., male, aged 30 years. Seen December, 1915. History of exposure to and of treatment for syphilis. Skiagraphy negative. Difficulty in reading for four months. R.V.=6/36; L.V.=6/18, and with −0.5D. sph., L.V.=6/12+. Optic discs normal.

Fields show typical bitemporal hemiopia in a relatively early stage, characteristic defects being present only for small objects. The vision of the right eye deteriorated to less than 6/60, the upper part of the letter only being visible. The left eye improved to 6/6 partly. Pot. iodide and mercury were ordered, and when last heard of the vision was very much better. Plate II, Fig. 4, shows the field of the right eye by Bjerrum's method. Note the hemiopic shape of the scotoma, which is very dense in its upper part (30/2,000 not seen) corresponding to the apex of the first quadrant, less dense below (30/2,000 seen, but objects smaller than 20/2,000 not seen) in the part corresponding to the apex of the second quadrant. On the nasal side the field for 0.5/2,000 white is confined to an area corresponding to the apex of the fourth quadrant, practically coinciding with the field for 4/2,000 red. Vision is, therefore, worst in the first, and best in the fourth quadrant of the central area, the lower quadrants having intermediate values. The peripheral changes are not far advanced in this case, but the right field, as a whole, shows the clockwise course of the defect very well. In the left field there were early peripheral changes sufficiently advanced to show complete temporal hemiopia for a very small test object. There was no scotoma and no differentiation of quadrants was present. Potassium iodide with mercury was ordered, and, when last heard of in May, 1916, the sight was reported to be much better. Presumably the cause was a syphilitic basal meningitis.

CASE XXIII.—H. B., female, aged 40 years, seen March, 1916, under the care of Professor Gulland. Acromegaly of about 6 years' duration. Sella Turcica enlarged: amenorrhœa, headache, rotatory nystagmus, and loss of convergence present. The right eye diverges and its optic disc is slightly pale. Left disc normal. Pupils small and react normally. Corrected vision: R. 6/12, L. 6/9 part. Both fields show advanced bitemporal hemiopia with some perception of large white objects still remaining in the second quadrants, which have an uncinate shape, indicating the previous presence of scotomata. Colour best recognised in upper-inner quadrants. Plate II, Fig. 5, shows field of left eye by Bjerrum's method. In the right eye the condition was similar, though it was not easy to get a definite chart. Later, however (May 19th), a similar chart, Plate II, Fig. 6, was obtained. An operation was performed on June 11th by Colonel Caird, who thought that the sella had been entered, though nothing could be removed. On June 25th, R.V.=6/9−1, L.V.=6/6−1, and the headache, nystagmus, and weakness of convergence had improved. The perception of large white objects in the second quadrants was now practically lost, and the differentiation into upper and lower quadrants on the nasal side was undemonstrable. Evidently there had occurred improvement in direct vision and in the nasal fields, and also in the other ocular conditions with the exception of the temporal fields, which continued to show progressive loss. When last seen on July 14th, 1916, the corrected vision was R. 6/9−1, and L. 6/6. The discs were as before, the divergence had disappeared, but the nystagmus was more evident again. The temporal vision for a large white object, 60/300, was now absolutely lost, and colour quadrant-differentiation on the nasal side was found occasionally, although not with sufficient certainty to chart. This sign was, however, much more evident than on June 25th.

A letter from her doctor, dated November, 1916, states that the headaches are very severe again, but the vision still much the same.

Nystagmus is referred to by Uhthoff [56] as a rare symptom occurring in about 6 per cent. of cases of acromegaly, and less often in pituitary tumours without trophic disturbance.

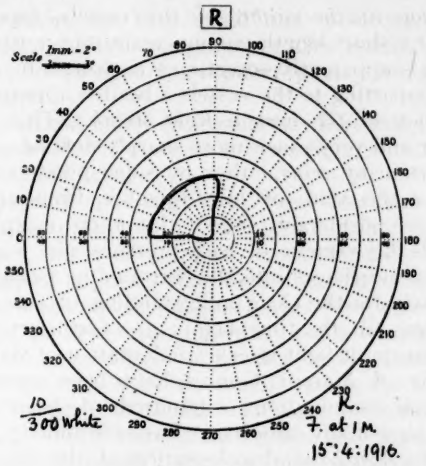

FIG. 25.

CASE XXIV.—K., male, aged 29 years, seen April, 1916, under the care of Professor Gulland. Pituitary infantilism with enlarged sella Turcica. Appearance is that of a boy of 13 or 14 years. R.V. = counting fingers at 1 metre, L.V. = 6/24. Discs deeply cupped and slightly pale, but not definitely atrophic in appearance. Fig. 25 shows field of R.E. The left field showed complete temporal loss without obvious differentiation into quadrants on the nasal side. The patient's mentality, however, prevented a more detailed or prolonged examination.

(To be continued.)

THE RETINAL SIGNS OF ARTERIO-SCLEROSIS COMPARED WITH THOSE DUE SIMPLY TO INCREASED BLOOD PRESSURE.*

BY

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LONDON.

IN 1897, in Volume XVIII of the *Transactions* of the Ophthalmological Society of the United Kingdom, Mr. Marcus Gunn published his monumental work on the retinal signs of arterial sclerosis.

* Read in the Section of Ophthalmology of the Royal Society of Medicine on February 7th, 1917.

From the clinical side there has been little or no advance since.

Mr. Gunn laid down four cardinal signs of sclerosis of retinal vessels, *viz.* :—

1. A tendency to *tortuosity of the arteries*, especially the smaller vessels.

2. *Variation in the calibre* of the vessels, especially sudden diminution for a short length passing again into normal size.

The calibre is apparently sometimes narrowed by nodules in the vessel walls, imparting to the vessels a beaded appearance.

3. *Alteration of the normal light streak.* This becomes very much brighter and very much more sharply defined.

4. *Indentation of veins*, either by super-pressure of the artery crossing above the vein, or infra-pressure from crossing below. When there is considerable indentation there is great obstruction followed by all the sequelæ of back pressure, *viz.*, stasis, thrombus, œdema, and hæmorrhages into the surrounding tissues.

It is necessary for the clear understanding of this paper to keep these four signs all the time before us: tortuosity; variation of calibre; alteration of light streak; indentation of veins.

These signs of Marcus Gunn's have been confirmed by the ophthalmoscopic examinations of hundreds of observers since; but no additional sign of any importance has been added. de Schweinitz emphasises the brick-red discolouration of the disc as a late but important sign; this is due to the dilatation of the capillaries and is the consequence of the venous obstruction and back pressure.

Mr. Gunn was undoubtedly one of the first who advanced the opinion that arterio-sclerosis was not confined to old age, and that old age was not alone productive of these changes.

The prognosis of these cases was at first regarded as very bad indeed. Some years back, however, I came to the conclusion that this dire prognosis did not apply nearly so universally as was at first supposed. In following up the after-history of these patients I found that some with very advanced mischief, such as considerable retinal œdema with hæmorrhages, improved marvellously under treatment, and in some cases, to my surprise, the cardinal signs largely disappeared.

At times, also, cases were published in the journals, such as the following, which appeared in the *British Medical Journal* of August 6th, 1910. The case was published by Dr. W. M. Crofton, lecturer in special pathology, University College, Dublin, and was entitled:

"*Recovery from Apparent Arterial Sclerosis.*"

This is the gist of Dr. Crofton's publication :—

Patient, aged 60, manager of a large commercial concern, had led a strenuous life. He was very short of breath, and suffered from palpitation. A specialist diagnosed cardio-sclerosis, and ordered

him a sea voyage. His urine contained a trace of albumen, but no sugar.

Owing to a feeling of weight on the top of his head and aching of the eyeballs, he was sent to Mr. Claud A. Worth. Mr. Worth's report was :—

"Retinal arteries are very small and tortuous. Central light streak very wide. Where an artery crosses a vein, the latter is so compressed as to be apparently interrupted. No retinal œdema. No hæmorrhages."

Patient was placed under treatment for three months, after which he returned to work. Two months later he again saw Mr. Worth, who reported as follows :—

"Retinal arteries are large and have lost the 'silver wire' appearance. The appearance of interruption of the veins is much less marked ; in fact, the arteries appear normal for a man of his years."

The publication of cases like this, and my own observations, compelled me to ask myself repeatedly this question : Can sclerosed vessels change in appearance in this manner ? Are these cases, which often show advanced signs (for surely back-pressure and œdema must pass as very advanced signs), are these advanced cases, which improve so much, incipient sclerosis, or are they sclerosis at all ? We know that iodides may produce absorption of round-celled infiltration ; and we may reasonably conceive of resolution of the hypertrophied muscle cells and elastic fibres ; but are we justified in expecting the disappearance of organized granulation fibres and connective tissue ? General experience answers—No. May not the signs, then, be due to some cause other than sclerosis ?

Again, I observed that these changes could occur with *startling rapidity*. I saw patients, whose eyes I had carefully examined only a very short time before (in some cases only a few days), and whose vessels had appeared perfectly healthy and normal, and I saw those patients after a severe attack of influenza, scarlet fever, or some other toxæmia, develop these signs of retinal sclerosis, with deep indentation of veins, and a macular œdema sufficient to reduce their vision from normal to 6/12.

It was impossible to believe that an advanced fibrosis had occurred in a few days, nay, in a day or two. It was equally impossible to believe that these signs could be due to round-celled infiltration preliminary to fibrosis, for in many cases, after lasting for months, the signs largely or entirely disappeared. In these months the infiltration would surely have become organised.

I became certain, then, that these cardinal signs of Marcus Gunn did not *necessarily* indicate arterial sclerosis, but were often due to some accessory cause.

Many years ago at Moorfields, when observing these cases, I

began taking the blood pressures of the patients with a *Riva-Rocci* manometer. In nearly all the cases the blood pressure was raised considerably above the normal, and in many cases excessively so. Often the patients sought advice for headaches which they thought were due to their eyes, but which were not relieved by suitable lenses. I commenced treating these patients with depressor drugs, strict diet, exercise, baths, etc., as recommended by the various authorities on blood pressure. I noticed that when I was successful in lowering the blood pressure to any considerable extent, along with the relief of the head symptoms, the ophthalmoscopic signs of retinal sclerosis appreciably diminished.

Increased blood pressure, then, accounted for some of the cardinal signs.

When the toxic cause of the high blood pressure was traced and was successfully removed, such as by the complete clearing of the mouth of septic stumps, the improved changes in the retinal vessels were still more remarkable.

If, then, some of these cardinal signs were produced by the high pressure of the blood alone without sclerosis, while other signs were due to sclerosis, it became important to decide if it was possible to distinguish between the changes due to the simple raised pressure and those due to the more serious sclerosis. In the discussion on retinal vascular disease at the Ophthalmological Society, during the Session 1912-1913, I ventured to state that I thought it was possible with the ophthalmoscope to distinguish between the signs of high tension and the signs of angio-sclerosis.

The following seem to me the distinguishing characteristics :—

In simple high tension,—

1. The vessels have an appearance of *uniform* distension and fulness.

2. The light streak is *broadened* out : it may be greatly increased, apparently reaching almost the whole breadth of the vessel.

3. The light streak is very much brighter than normal, the brilliancy increasing with the increase of the tension, until with very high tension it becomes like bright copper wire (not silver wire).

4. The tight arteries indent the veins ; with medium high tension they indent them slightly, with very high tension they indent them deeply, leading to back-pressure and all its consequences.

The following signs indicate sclerosis :—

1. *Irregular* tortuosity, especially of the smaller twigs.

2. Increased brilliancy of the light streak, while at the same time the light streak appears *narrower* and more central.

3. Irregularity of calibre and beading are sure indications of sclerosis.

4. General diminution in the size of the vessels and "silver wire" reflex show advanced sclerosis.

Now, of course, these two conditions of high tension and sclerosis very frequently coincide, but not by any means always. I have seen cases of definite early sclerosis of the retinal vessels with only slightly raised blood pressure. The blood pressure has been suddenly raised by some toxic infection, or by artificial means, and the above signs of high tension in the retinal vessels have been added to the previous ones. These signs have again disappeared on lowering the blood pressure or eliminating the toxic cause. On the other hand, in advanced "silver wire" sclerosis, I have never seen the signs of sclerosis removed. I have seen some diminution in the intensity of reflex when the vascular pressure has been lowered by drugs, or the heart pressure has failed; the ophthalmoscopic signs of sclerosis always remained in evidence.

The question whether *continued* high blood pressure induces sclerosis perhaps scarcely concerns us here. But, for my part, I do not think it necessarily does. For instance, there may be a raised pressure from aortic disease, with perfectly compensated hypertrophy. This may last for a lifetime without any signs of vascular sclerosis becoming evident. Again, in myxœdema the blood tension is raised (probably from the imbalance of the suprarenal and thyroid secretions) without signs, that is, retinal signs of sclerosis.

When continued high tension is followed by sclerosis, this sclerosis may be due to the same toxin which caused the high tension.

Now, to confirm the above deductions, I called in the assistance of my House Surgeon, Mr. du Toit. We took a number of cases in the Salisbury General Infirmary, and artificially raised the blood pressure.

We selected, as far as possible, healthy cases from the surgical side of the Infirmary, such as males admitted for radical cures of hernia. We carefully examined the retinal vessels of each patient by a good illumination from a fixed light, and with a mydriatic in the eyes; and we made careful notes of the conditions of the vessels. We then took the blood pressure with a manometer and noted it carefully from two or three examinations. We next administered a hypodermic injection of 5-8 minims of adrenalin chloride in normal saline, and the blood pressure was recorded at intervals until it was found that there was no further rise. This was roughly 1-1½ hours after injection. Some cases responded well, the blood pressure rising 40-45 mm.; others to a lesser extent, with a rise of 20-30 mm.; and in some there was no rise of blood pressure after the injection of adrenalin chloride.

When the pressure was considerably raised, then another careful observation of the retinal vessels was made and a description of them accurately noted down.

As these experiments can be easily repeated by any ophthalmic surgeon, further details are not of any value.

From this artificial raising of the blood pressure, we observed in the retina :—

1. Increased fulness of the arteries.
2. Increased brilliancy of the light streak.
3. Increased breadth of the light streak.
4. (a) Indentation of veins, where previously not indented.
   (b) Increased indentation of veins (in a few cases, very much increased), where previous slight indentation existed.
5. The reduction of all these signs on the return of the blood pressure to its former level.

From long experience, and from the above experiments, I think it is even possible to indicate roughly the actual height of the blood pressure in mm. of mercury from the observation of the retinal vessels alone.

Where there are no definite signs of sclerosis, I think :—

(a) Very slight indentation of veins, full arteries with broad light streak, indicate 145 – 150 mm.

(b) Very brilliant broad light streak with deeper indentation and slight signs of obstruction indicate 150 – 160 mm.

(c) Very brilliant broad light streak with apparent obliteration of veins indicate 160 – 180 mm.

Where the signs of advanced sclerosis are present, the veins may be indented and nipped at lower tensions.

In conclusion, there are, I think, one or two pitfalls which it is necessary to avoid.

1.—*The pitfall of faulty examination.*

In a case of high arterial pressure, it is frequently a matter of great difficulty to ascertain whether thickening of the vessel wall is present or not by a *digital* examination of the superficial vessels. It is here that the ophthalmoscope plays so important a part. The vessels can be seen as they are in life, and by the direct method of examination the image becomes magnified about 14 times. Hence the skilled ophthalmoscopist is able to detect change from the normal of a very slight amount, although to the inexperienced observer only very gross changes are detectable.

Here lies the pitfall.—Errors of refraction, especially high errors, blur the picture, and unless they are carefully corrected, the interpretation of what appears is fallacious.

2.—*The pitfall of acute toxæmia.*

In patients suffering from very severe toxæmia, we *may* see in the retina :—

(a) Broad arteries.

(b) Increased light streak.
(c) Engorged veins.
(d) Some very slight indentation of these engorged veins. Yet the blood pressure, as shown by the manometer, is abnormally low.

Such a condition one may see, for instance, in an acute Bright's disease, a very severe influenza, etc.

The explanation of the appearance of the retinal vessels is, I think, due to :—

(a) Relaxation of the vaso-motor control of the arteries ;
(b) Dilatation of the heart, with loss of its muscular power ;
(c) Consequent engorgement and stagnation of the venous system.

This general condition is due to the toxin circulating in the blood. In several of these cases I have listened to the heart's action, and found the sounds so weak as to be almost inaudible. On administering small doses of digitalis, with an apparent general improvement in the patient, the blood pressure has gone up with a jump, say, from 90 to 140 (this without any marked diminution of the albumin excreted in the albuminuric cases).

3. *The pitfall of the failing heart.*

A somewhat similar pitfall exists in cases of prolonged high tension with sclerosis, in which the heart's action suddenly begins to flag.

In such a case the retinal signs would indicate to the careful observer a fall in the blood pressure from what it previously had been, *yet* those signs would point to a higher pressure than the manometer would give.

Why is this ? Again because—

1. With the failing heart, the stagnation of the blood stream produces swollen veins.
2. Owing to the hardness of their walls the arteries remain rigidly fixed.
3. The swollen veins *appear* to be obstructed by the rigid arteries.

Keeping in mind these three liabilities to err, *viz.* :

Faulty examination ;
Acute toxæmia ;
The failing heart :

I think it is possible for the ophthalmic surgeon to distinguish by means of the ophthalmoscope between increased blood pressure and arterio-sclerosis, and to base his prognosis and treatment thereon.

A CASE OF METAL EMBEDDED IN THE LENS: NORMAL VISION REGAINED AFTER NINE MONTHS.

BY

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THE following case appears to be of sufficient interest to merit publication.

J. K., aged 20 years, a brass finisher, came to the Glasgow Eye Infirmary on the 25th March, 1916, stating that he had been struck on the left eye, three days before, by a chip of metal, and that the sight of the eye was becoming dim.

There was a small wound of the cornea just beyond the pupillary margin of the iris in the meridian of nine o'clock. The anterior chamber was formed, and it was seen that the sphincter of the iris was cut just behind the wound. In the notch so formed there was a small mass of greyish tissue lying on the lens capsule. The lens was slightly opaque, and in the middle of it there was embedded what looked like a small chip of metal. The metal seemed to be lying a very little behind the centre of the lens and to measure about 1 mm. in each direction. The eye was perfectly quiet, and there was no pain or tenderness. The tension was normal. R.V. 6/6, L.V. 6/60.

Ophthalmoscopic examination showed that the lens was slightly opaque, due to the presence in it of small faint clouds without any formation of radial lines of opacity. There was a slightly greater amount of clouding round the metal than elsewhere, but, using a +12 D. lens, it was clearly seen that the foreign body was certainly metal. (The patient stated that the metal was soft iron.)

As there was no indication for immediate operation, it was decided to leave matters as they were, and to watch the case carefully. The patient was instructed to attend (out-patient) each week.

Notes were made as follows:—

April 1st, 1916.—Eye quiet, lens rather more opaque. L.V. 6/60.

April 8th, 1916.—Eye quiet, lens not any more opaque. L.V. 6/60.

April 15th, 1916.—Eye quiet, lens seems to be clearing a little. L.V. 6/36.

April 22nd 1916.—Eye improving steadily. L.V. 6/24.

May 13th, 1916.—Lens now clearing manifestly. L.V. 6/18.

June 17th, 1916.—Centre of lens clearer, faint haze near periphery of lens only. Metal now seen very clearly with a + 12 D. lens. L.V. 6/14.

July 17th, 1916.—Lens almost entirely clear now, eye very quiet and well. Allowed to return to work. L.V. 6/9.

October 14th, 1916.—Eye very well, no discomfort from working. L.V. 6/6, 3 letters.

December 16th, 1916.—Eye still quiet and well, no cloud seen in the lens now. Metal visible very clearly, sharply-defined and perfectly bright (no rusting). L.V. 6/6, full.

As the patient is a very intelligent man, he is permitted to cease attendance at the Infirmary unless anything untoward develops.

He states that he suffers no inconvenience from the presence in the eye of the piece of metal or from the existence of the notch in the iris (which is quite small). He cannot observe any definite obstruction to vision due to the presence of the foreign body, but he can, of course, see the metal objectively, as it may be said, when he looks in a mirror, for it is clearly visible to anyone who observes the eye at all attentively.

Remarks.

There are several specially interesting features in this case.

The metal must have been quite aseptic to allow of its passage through the cornea and iris without giving rise to any infection. It was probably very hot at the moment it entered the eye, which would account for asepsis.

The wound of the lens capsule seems to have been plugged by a small portion of iris which was carried in by the metal and left in the little opening. This would explain why the lens did not become entirely opaque.

The cloudy opacities in the lens cleared away entirely, leaving the metal as distinct as if it were lying in water. Probably the youth of the patient conduced to this satisfactory result.

The metal has not rusted, so far as can be detected, in the very least, which may be due to the fact that it was soft iron, not steel. The absence of rusting should conduce to the preservation of vision, and it is probable that a much better result will be attained than if extraction had been attempted. It is quite possible that opacity may develop when the influence of age begins to tell on the lens, but, at all events, several years of useful vision may be hoped for before this takes place.

There are several records in literature which point to the advisability of leaving nature to deal with such a case, amongst which may be quoted the following :—

Doyne (*Transactions of the Ophthalmological Society U.K.*, Vol. XIV, p. 219), a chip of copper in an eye which retained useful vision for nearly thirty years.

Paderstein (*Deutsche med. Wochenschr.*, 1909, S. 1,041), a chip of metal seen in a clear lens ; eye retained full vision.

Ginestous (*Ophtal. Provinc.*, T. IX, p. 149), a case in which a chip of metal lodged in the lens and ultimately permitted of full vision.

Laqueur (*Arch. f. Augenheilk.*, Bd. LIII, S. 97), two cases in which chips of glass were embedded in the lens and permitted of useful vision for several years.

Nottage (*Ophthalmic Record*, 1899, p. 78), a case in which a chip of metal was seen in a lens thirty years after injury; corrected vision 6/18.

It is true that Elschnig has recorded a case (*Klin. Monatsbl. f. Augenheilk.*, 1913, June), in which a chip of metal was successfully extracted from a lens (near its posterior pole), and in which normal vision was ultimately attained. Such a result must surely be even more rare than in the cases in which the metal is not extracted.

Doyne (*Transactions of the Ophthalmological Society U.K.*, Vol. X, p. 198) mentioned a case in which metal had passed through the lens and lodged in the retina, leaving only a faintly visible track. Similar cases have been recorded by other writers, and Praun ("*Die Verletzungen des Auges*," Darmstadt, 1899) notes several instances in which lenses injured by needle-prick and other somewhat similar causes, have become hazy and ultimately cleared practically completely.

In nearly all the cases referred to the subjects have been quite young at the time of injury, and it seems safe to conclude that the age of the patient is a determining factor in the favourable result. Certainly, a most important point is that the metal should be aseptic.

ABSTRACTS.

I.—ANATOMY.

Wallis, G. F. C. (Margate.)—Some observations upon the anatomical relations of the optic nerves and chiasma to the sphenoid bone. *Practitioner*, January, 1917, p. 41.

This study is from the point of view of the rhinologist in regard to disease of the post-nasal sinuses, especially the sphenoidal. Eleven subjects were examined, the method followed being to remove the calvarium and then dissect away the brain piecemeal. The results, which showed considerable variation, are presented in a table. In no case did the chiasma rest wholly upon the optic

groove. In one case rather more than half of it rested upon the optic groove and olivary eminence, the posterior part lying on the pituitary body, and in another it was far enough forward just to touch the olivary eminence. The author concludes that while the chiasma does occasionally lie upon the optic sulcus, it is nearly always completely posterior to it. The chiasma measured from 7 mm. to 11 mm. anteroposteriorly and about 3 mm. less laterally, so that at most only a small part of it could ever lie upon the optic groove. The intracranial part of the optic nerves was found to vary between 7 mm. and 12 mm. in length, and the angle formed by their junction became more acute, the more posterior the situation of the chiasma. When the latter was relatively far forward the angle became U-shaped or even like a bent bow. Several other points are discussed, such as the extent of the bony surface between the limbus sphenoidalis and the anterior margin of the sella Turcica, the antero-posterior measurement of the latter, the length of the optic canals, and the extent and condition of the sphenoidal sinus. A relationship, which is of interest to ophthalmologists, namely the height at which the chiasma is suspended above the diaphragma sellæ, is unfortunately not mentioned; indeed, the reader is led to believe that the chiasma normally, to some extent, rests upon the pituitary. This is contrary to the findings of other observers. It is probably impossible to ascertain this point with accuracy by removing the brain from above, and no doubt it was omitted on this account. H. M. TRAQUAIR.

II.—RADIOGRAPHY.

(1) **Johnston, George C. (Pittsburgh).—Radiography of the sella Turcica and pituitary body.** *New York State Journal of Medicine*, November, 1916.

(2) **Heuer, George,** and **Dandy, Walter E.—Roentgenography in the localization of brain tumour, based upon a series of one hundred consecutive cases.** *Bulletin of the Johns Hopkins Hospital*, Vol. XXVII, No. 309. Baltimore, November, 1916.

(1) As **Johnston** himself points out, the title of this article is somewhat misleading, inasmuch as it is but rarely that the pituitary body can be observed radiographically. Under ordinary circumstances we observe merely the bony pocket that lodges the gland, and not the gland itself, unless the latter has undergone marked pathological changes.

The article covers much ground, and a *résumé* of its chief contents may be of service to our readers.

The *technique* found most satisfactory by Johnston has comprised the employment of finely focused heavy anode transformer tubes, lately of the hydrogen type, working at a voltage not exceeding 60,000, and usually less, with an exposure of 200 m.a. seconds and fairly fast plates with fine grain. Other necessary requisites are absolute immobilization of the head, and small diaphragms. The centre of the sella Turcica is determined by indicating a line from the glabella to the external auditory meatus. At a point $1\frac{1}{4}$ inches anterior to the meatus on this line a perpendicular $\frac{3}{4}$ inch high is erected, and through the point established at the end of this perpendicular the principal ray is passed, so as to emerge at a corresponding point on the opposite side of the skull. Johnston has found the foregoing method of location to be accurate enough in the majority of cases to produce a test plate. By "test plate" he means a plate in which the floor of the sella appears as a sharply-defined white line and the anterior and posterior clinoid processes are superimposed upon their opposites. This plate having been obtained, a stereoscopic pair may be made as well, it being recommended that the stereoscopic movement be from above downward towards the base rather than from the glabella towards the occiput.

In considering the types of sellar deformation that may be considered to lie within the limits of the normal, Johnston points out that the first consideration is the examination of the relative size of any sella. He claims that an observer who has examined a few hundred sellas will at once notice any disparity in size as compared with the rest of the skull. The average size of the pituitary is given as about 12 mm. transversely, 5 mm. from above downward, and about 7 mm. in the sagittal direction. There appears to be a rather constant relation between the thickness of the floor of the sella and the size of a sphenoidal sinus, of which it forms the roof. The larger the cubical contents of the sinus, the thinner is usually the floor. If the floor of the sella be thick, a diseased pituitary body may be expected to enlarge at the expense of the clinoid processes. Enlargement will progress in the direction of least resistance. Thus, if the anterior clinoids are well developed, and the posterior clinoids rudimentary, enlargement will be backward, and absorption of the posterior clinoids may be the only evidence. On the other hand, if the opposite conditions obtain, then the enlargement will be forwards. In the third instance, where all the clinoid processes are of heavy construction, pressure will be manifested downwards. In that event the clinoids will not suffer pressure-atrophy, but the pituitary body will embed itself in the sphenoidal sinuses, destroying the roof in this slow journey

downwards. Were it not for the presence of the dural process stretching between the anterior and the posterior processes, we should be unable to make an early Roentgen diagnosis of pituitary "struma," since the gland would simply grow upwards and sellar deformation would be a very late phenomenon.

In considering the changes induced in the region of the sella by pathological alterations in the pituitary body, we shall be at once struck by the difficulty experienced in obtaining satisfactory Roentgenograms. The author explains this as due to the fact that as the pituitary begins to enlarge, a pressure-atrophy is manifested upon the entire portion of the sphenoid which surrounds the hypophysis. The clinoid processes become relatively transparent, and consequently the detection of the outline of the sella becomes increasingly difficult. Stereoscopic plates do not aid us as much as we could desire.

If the anterior processes disappear first, we may expect marked ocular symptoms, with temporal hemianopsia, progressing to complete optic atrophy. If the posterior clinoid processes be destroyed first, there may not be the same degree of optic atrophy, but there will be interference with the functions of the posterior lobe, as shown by epilepsy, etc.

In rare instances the tumour itself may be seen, elevating the membranous roof of the sella. In many instances the pressure is directed downwards and the roof of the sphenoidal sinus has yielded, so that the tumour occupies a large portion of the sinus itself. In other instances the great size of the tumour completely destroys all landmarks. It is impossible to differentiate basilar tumours of the middle cranial fossa lying in the middle line by X-rays alone from tumours of the hypophysis. Where there exists an erosion of but one of the clinoid processes, it is sometimes possible to diagnose tumours of the anterior and posterior cranial fossæ.

Johnston draws attention (not for the first time) to certain variations met with frequently in the sella and the anterior fossa of the skull in idiopathic epilepsy. These changes consist in a more or less pronounced hyperostosis involving the clinoid processes, the anterior fossa, and in some instances the post-clinoidal region.

All cases of optic atrophy where increased intra-cranial pressure is suspected should be examined with care in order that internal hydrocephalus, if present, may be diagnosed at the earliest moment. He believes that in every case evidence of pressure, as shown by the moulding of the internal table to the contour of the convolutions of the anterior lobes, will be found to be present, at least by the time that any considerable degree of contraction of the visual field is present. These markings are very faint in the beginning, but later the characteristic impressions make their appearance. They

may be masked by the simultaneous occurrence of internal and external hydrocephalus. In such cases the existence of pressure may be suspected by the change in angle in the middle fossa of the base. S. S.

(2) This valuable article is one which should be read by the neurologist, the ophthalmic surgeon, and by everyone interested in cerebral surgery, while to radiographers it must be an article of supreme interest, and to British radiographers it may be hoped that it will serve as an incentive to achieve better results in this branch of their art than they have for the most part hitherto achieved.

The very useful plan has been adopted of reproducing the X-ray picture in duplicate. Under each untouched print appears a second picture, in which details lost in reproduction have been intensified. This appears a very practical and absolutely fair way of bringing before the reader features which, although undoubtedly present in the untouched picture, are with difficulty identified in the absence of personal demonstration by the author. A large number of cases deal with variations in the sella Turcica, and the authors have proved by autopsy in certain cases, that shadows in or directly above the sella are due to areas of calcification.

A general conclusion is reached that uncalcified brain tumours do not cast shadows unless the tumour tissue has invaded the accessory sinuses, although possibly an exception has to be made in regard to some hypophyseal lesions which are viewed against a dark temporal fossa.

Calcified or bony tumours cast shadows which are readily recognised; such shadows may occur as frequently as in 6 per cent. of all patients with brain tumour. One case of exceptional interest is that of a large aneurism of the internal carotid artery, in which two calcified areas gave shadows in the shape of more or less concentric thin lamellæ. The authors point out that erosion of the sella Turcica and destruction of its posterior clinoid processes are not conclusive evidence of pituitary tumour. Such bony changes may be due to the local pressure of tumours arising in an adjacent part, or even to a general increase of intra-cranial pressure arising from cerebral or sub-tentorial lesions; while, on the other hand, pituitary tumour may be present with very little or no change in the sella Turcica. These two facts emphasize the necessity for the combined study of clinical and radiographic signs in all cases.

The X-ray work at the Johns Hopkins Hospital has been brought to such a state of perfection that the authors are able to recognise and to illustrate such valuable signs as general enlargement of the skull, allowed for by opening up of the sutures of the calvarium, and thinning with general convolutional atrophy of the skull, and they point out that such manifestations are generally associated with lesions below the tentorium cerebelli, which have induced

hydrocephalus, although one such case in their series was due to a supra-sellar lesion causing an obstructive hydrocephalus, initiated in the third ventricle. They have also been able to identify in their X-ray pictures such remarkable conditions as calcification in the choroid plexus, calcification in the pineal gland and in the falx cerebri, enlargement of the internal auditory meatus, and the presence of an enlarged intracranial vein and its tributaries.

J. H. FISHER.

III.—THE RETINAL CIRCULATION IN ARTERIO-SCLEROSIS.

Moore, R. Foster (London).—The retinal circulation in arterio-sclerosis. *Trans. Ophth. Soc. U.K.*, Vol. XXXVI (1916), p. 319.

Following the teaching of Gull and Sutton (1872), **Moore** regards the primary change in arterio-sclerosis as a general disease, commencing in the arterioles and smaller arteries and producing secondarily increased resistance to the onward passage of the blood, causing the tissues to suffer in their nutrition. This leads to an increase in the force of the heart-beat, and hypertrophy, together with increased pressure in the large arteries, follows.

In the present communication the author adduces reasons for believing that, at any rate in some cases of arterio-sclerosis, the pressure in the intra-ocular vessels so far from being raised, may be actually less than normal. It was shown by Gull and Sutton that so-called "arterio-capillary fibrosis" affected the vessels of the pia mater, kidney, spleen, lungs, etc. But if Moore's suggestion with regard to the pressure in the small vessels of the eye can be substantiated, it is also doubtless true of the other vessels. It is pointed out that the conditions in the eye can be investigated upon lines that are not available in other parts of the body, owing to the ophthalmoscope and Schiötz tonometer. Normally, the blood enters the eyeball through the central retinal and ciliary arteries at a pressure of 100 mm. of mercury (Leonard Hill), and is opposed by an intra-ocular pressure of about 20 mm. of mercury. Pulsation is not seen in the retinal artery, although if the intra-ocular pressure be raised by finger pressure, it will be found that when the intra-ocular pressure is raised by that means to a point in excess of the diastolic arterial pressure, blood enters only during systole, and the central artery, as observed with the ophthalmoscope, pulsates. Moore points out that in some cases of arterio-sclerosis, with very high pressures in the larger arteries, a degree of pressure with the finger is sufficient to produce pulsation, which is

less than that required in a healthy patient. The inference is that in such cases the diastolic pressure in the retinal artery is less than that of a patient with a normal blood-pressure. There are special difficulties in the way of estimating the systolic pressure in a similar manner. Evidence from a consideration of variations in the intra-ocular pressure bears upon the mean pressure in the intra-ocular vessels, but does not differentiate the systolic from the diastolic. Its bearing, also, is upon the pressure in the ciliary vessels, since it is upon them that the intra-ocular pressure depends.

In connection with the conclusion that the mean pressure in the ciliary arterioles and capillaries is not raised as a result of a very high pressure in the large vessels, the following additional observations are of some importance.—The pulse wave from inside the eyeball is transmitted to the lever of the Schiötz tonometer. In the presence of severe arterio-sclerosis the lever shows less amplitude of movement, and in a few cases no pulse is to be seen. Sixty-one patients were examined from this point of view, and the average systolic blood-pressure of the three groups into which they were divided was afterwards worked out. The figures were as follows:—

Pulse movement of lever.	Number of Patients.	Average systolic blood-pressure.
Well seen	25	168 mm. Hg.
Poorly seen	29	190 „ „
Not seen at all ...	7	225 „ „

From the foregoing figures, it will be seen that the amplitude of the pulse movement is inversely proportional to the degree of arterio-sclerosis as judged by the blood-pressure, and allowing for the fact that local changes in the vessels would tend to prevent the transmission of the pulse to the other contents of the eyeball, the observations are at least compatible with the view that the pressure in the ocular vessels is not raised.

If the ocular vessels are the subject of sclerosis and the blood-pressure within them is not compensatorily raised, the retinal functions are likely to be impaired, and this may be brought about in two chief ways: (1) there may be thrombosis in the artery; (2) there may be a gradual impairment due to a relative starvation of the tissues.

Moore has watched five belonging to the first group of cases for several years. He notes that all the patients were the subject of marked arterio-sclerosis, with obvious disease of the retinal vessels. The onset usually occurred at night. He has recently seen a man

who complained of defect of sight as soon as he recovered from an anæsthetic, given for the performance of a somewhat severe operation. The immediate cause of the thrombosis was doubtless the lowered blood-pressure during somewhat prolonged anæsthesia. As regards the second group of cases, deterioration of sight is gradual, and such patients may develop thrombosis of the artery.

It appears probable that the only sites in the body other than the eye in which thrombosis of a vessel of the size of the retinal artery would give rise to immediately noticeable symptoms are the heart, the internal ear, and parts of the central nervous system.

Moore, in conclusion, suggests that vigorous measures directed towards the lowering of blood pressure, whilst they may relieve a failing heart or avert a cerebral hæmorrhage, are liable to act inimically towards the nutrition of the tissues of the body, by further reducing the already curtailed blood supply, and making the occurrence of thrombosis in the small vessels more probable. S.S.

IV.—RUPTURE OF DESCEMET'S MEMBRANE.

(1) **Bergmeister, Rudolf (Vienna).—Rupture of Descemet's membrane with partial necrosis of the cornea in eyes affected with glioma (Ruptur der M. descemeti mit partieller Nekrose der Hornhaut im Gliomauge.)** *Zeitschrift für Augenheilkunde*, Bd. XXXII, 1914, S. 205.

(2) **Walker, Sydney, junior(Chicago).—Fracture of Descemet's membrane.** *Annals of Ophthalmology*, April, 1916.

(1) **Bergmeister** states that rupture of Descemet's membrane is chiefly seen in cases of buphthalmos and keratoconus. Wintersteiner described it in gliomatous eyes, and Coats found it in a specimen of high myopia. He suggested that the tension must have been raised in this case, for he invariably failed to detect any ruptures in pure myopia.

The consecutive changes which take place in the cornea when there are ruptures in the membrane are of interest, and led the author to publish his case.

The first part of the paper is devoted to a minute account of the histology of a case of glioma in a child. The parents had refused to allow the eye to be removed until the tumour had spread widely into the anterior segment. The optic nerve was infiltrated, and there was evidence of long continued high tension. The scleral capsule was distended by the pressure, and the lens deformed. The absence of tumour cells in the choroid was remarkable. This

structure was highly atrophic. The ciliary body was infiltrated, and the iris replaced by tumour growth. The muscular tissue in the ciliary body and iris showed a marked resistance to the new growth. It is noteworthy that there were no signs of any inflammatory reaction in the globe. The membrane of Descemet was ruptured, and there was an area of necrosis deep in the cornea. The corneal tissue exposed by the ruptures was covered with a new connective tissue growth or transformation.

The ruptures were caused by the very high tension and stretching of the cornea. This was manifested by megalo-cornea and intercalary staphyloma.

Living glioma cells have no action upon the endothelium of the cornea.

Fuchs has pointed out that the cytotoxines of carcinoma cells cause inflammatory reaction, but this is not the case with living sarcoma cells from the retina. These tumours can attain a large size in the globe and yet give rise to no inflammatory signs. When, however, the tumour begins to necrose, toxins are liberated, which cause inflammation.

The partial necrosis of the corneal tissue found in the author's case must be ascribed to toxins from degenerating glioma cells.

The same toxin acted as a stimulus, and new connective tissue was formed. T. HARRISON BUTLER.

(2) The peculiarity of this case by **Walker** lies in the fact that the "fracture" of Descemet's membrane followed injury by a blunt object.

The patient, a man aged 32 years, was first seen a week after the injury. The cornea was slightly hazy, and with oblique illumination, five almost vertical striæ, resembling cracks in ice, could be readily seen on the posterior surface of the cornea. V.=5/200. Pain and marked ciliary redness. Under local treatment by cold packs and atropine and dionine, vision became worse, dust-like deposits appeared in the cornea, and there were many opacities in the vitreous. Tension fell to — 2. After about two months' treatment, matters were complicated by detachment of the retina. The ruptures in Descemet's membrane could no longer be found or seen.

Walker concludes that; (1) Fracture of Descemet's membrane from blunt force is relatively rare. (2) it is usually complicated by intra-ocular hæmorrhage, cataracts, etc.; (3) it is more likely to happen in youth than in old age; (4) it usually leaves permanent scars, but they may at times disappear soon. S. S.

V.—BACTERIOLOGY.

(1) **Macleish, A. C. (Los Angelos).—Keratitis, caused by infection with bacillus coli.** *Arch. of Ophth.*, July, 1915.

(2) **MacGillivray, Angus (Dundee).—A bacteriological and clinical study of the external diseases of the eye.** *Royal London Ophthalmic Hospital Reports*, Vol. XX, part 2, 1916.

(3) **Fuchs, Adalbert (Munich).—A new bacteriological finding in a corneal infiltration. (Ueber einen neuen bakteriologischen Befund in einem Hornhaut-infiltrat.)** With three illustrations. *Archiv für Augenheilk.*, Bd. LXXVIII, S. 139.

(4) **Scarlett (Paris).—Diplobacillary corneal infections. A note on two hitherto undescribed diplobacilli (bacillus duplex non-liquefaciens and bacillus duplex Josephi). [Infections cornéennes à diplobacilles. Note sur deux diplobacilles non encore décrits (bacillus duplex non-liquefaciens et bacillus duplex Josephi).]** *Ann. d'Oculistique*, mars, 1916.

(5) **Brown, E. V. L., Irons, E. E., and Nadler, W. H. (Chicago).—The localisation of streptococci in the eye: A study of experimental irido-cyclitis in rabbits.** *Arch. of Ophth.*, Vol. XLV, No. 3, May, 1916.

(6) **Lamb, H. D., Calhoun, J. G., and Alt, Adolf (St. Louis).—Two cases of bacillus pyocyaneus keratitis.** *Amer. Journal of Ophth.*, September, 1916.

(7) **Scarlett (Paris).—The differentiation of diplobacilli by humoral reactions. (Différenciation des variétiés de diplobacilles par les réactions humorales.)** *Ann. d'Oculistique*, novembre, 1916.

(1) **Macleish**, whilst working at the Royal London Ophthalmic Hospital, had his attention directed by S. H. Browning to the value of the use of an autogenous vaccine in case of marked keratitis, due to infection with bacillus coli.

Since then, he has met with no fewer than five cases of the same kind in private practice. Each showed a keratitis of a vesicular type, accompanied by a chronic cystitis, or by a recurrent diarrhœa, or by both. In each, a pure culture of bacillus coli was obtained from the urine, and in one case also from the aspirated contents of the anterior chamber. The youngest case was over 60, and the

eldest over 78 years of age. The longest duration of any one case was seven years, and the shortest one year (at intervals). The results of vaccine treatment were decidedly encouraging, but the patients seem to have been difficult to manage, which is scarcely surprising, considering their ages. R. H. ELLIOT.

(2) **MacGillivray** sets forth the results of a bacteriological examination of eyes, and especially of conjunctivæ, in the Dundee area. His objects were (1) to compare the findings in Dundee with those previously made in Aberdeen and Glasgow; (2) to determine the relations between clinical characteristics and bacteriological findings, with a view to arriving at a scientific diagnosis in each case; (3) to enable us to forecast the particular micro-organisms concerned from a careful and systematic examination of the symptoms in each case; and (4) to determine systematically and chronologically the micro-organisms producing various affections of the eye and its adnexa.

The investigation occupied nearly three years, during which 539 cases were examined. The period was free from any epidemic. An excellent schedule was drawn up and used, to ensure that no clinical symptom or other evidence would be overlooked. It was found that a reliable diagnosis of the micro-organisms concerned could usually be arrived at with certainty by the examination of smears alone, so that towards the end of the investigation, cultural experiments were resorted to only in exceptional cases. The *technique* used is carefully described. Tables showing the clinical diagnosis of the cases and the bacteriological diagnosis are given separately. The report contains a large amount of valuable information, and will well repay careful study. Some of the conclusions arrived at may be shortly stated.—The Morax diplo-bacillus was the most common micro-organism, whilst pneumococci and diphtheria bacilli were very rare. Tuberculous affections of the eye are practically unknown in Dundee. Most cases of chronic conjunctivitis are due to the diplo-bacillus, and those of acute catarrhal conjunctivitis to the Weeks organism. These two conditions can be diagnosed from the clinical signs alone.

The importance of a diagnosis based on the recognition of the causal micro-organisms is of the utmost value. This point is best illustrated in dealing with cases of hypopyon-ulcer of the cornea. Here the micro-organisms chiefly concerned are the pneumococcus and the diplo-bacillus. The treatment of the former by the cautery and of the latter by zinc salts is most satisfactory.

The presence of conjunctival discharge does not necessarily argue a bacterial cause, but, should a discharge be present, it must be regarded as a contra-indication to operative interference. A bacteriological examination should be made, and vigorous treatment

should be undertaken as a preliminary to operation. A mild unilateral muco-purulent discharge in an infant suggests congenital atresia of the tear duct, and the presence of a mucocele confirms the diagnosis. In the absence of a mucocele, the case may be one of mild unilateral blennorrhœa neonatorum. If pneumococci be found in the discharge, atresia of the tear duct may be diagnosed, since a pneumococcal conjunctivitis is always bilateral.

Despite the dust of Dundee, the town is comparatively free from cases of conjunctivitis, and for at least twenty years, no epidemic of Weeks ophthalmia has visited the town.

Gonorrhœal conjunctivitis is not common amongst adults, and ophthalmia neonatorum is on the decline, as a result of the measures which have been taken, and which include the instillation of a 25 per cent. solution of argyrol into the eyes of each new-born child. R. H. ELLIOT.

(3) In October, 1913, writes **A. Fuchs,** there came to the clinic a case of corneal infiltration, J. St.——, aged 17 years, with the following history: five weeks before, while pitching hay, he had been struck in the right eye. He experienced severe pain, which, however, quickly disappeared, so that he felt his eye had not been injured. However, after about a week, the eye became red, and the patient noticed that he could not see so well with it.

He was treated by his local doctor with ointment, and then with drops. This quieted the eye for the time, but the inflammation continued to return, and he noticed his vision slowly diminishing.

Examination showed the conjunctival vessels slightly injected. In the centre of the cornea there was seen a tiny epithelial defect, and at this point, under the superficial layers, a sharply-marked opacity, about the size of a pin's head. The iris was normal, the pupil, under atropine, was widely dilated; the fundus was normal.

Vision = fingers at 4 metres.

From a little pocket in the corneal infiltrated area, a tiny particle of thick white pus was obtained, and transferred to tubes of agar. On all the tubes, a pure culture of a Gram-negative spore-producing bacillus was found.

After eight days, the patient was discharged. In less than one month the patient appeared again with an attack of eczematous conjunctivitis in the left eye. This quickly cleared up, and the patient was discharged in four days.

Morphology of the micro-organism:

A bacillus, 1-2 μ. long and ·5 μ. wide, which was actively motile.

In stained preparations it appeared of uniform length—somewhat plump, with the ends rounded. Diplo-forms and filament forms are seldom seen. It stained well with the anilin dyes and was

Gram-negative. The organism was strongly aerobic. Grew well at room temperature, and in bouillon produced a snow-white scum.

The growth in gelatin plates, blood serum—agar plates—agar stab cultures—potato and in milk, is described in detail.

Inoculation of the rabbit cornea was tried by three methods :—

(1) The epithelium of the cornea was abraded and this point inoculated with the bacillus. Following a mild inflammation, there appeared an abscess with marked infiltration at the border. After three days, this quieted, leaving a long-standing opacity.

(2) Some drops of the bacillus culture were put in the parenchyma of the cornea by means of a Pravaz syringe. No reaction was noticed, only a very fine streaky opacity, which in the course of a few days, became more marked, and which after six weeks, remained the same as it was after one week.

(3) In the centre of the cornea, a pocket was made with a lance and some of a culture with spores was inoculated. Four days later, noticeable photophobia, with purulent discharge. The corneal epithelium was replaced and smooth, but a snow-white bordered opacity was seen in the deeper tissue. No hypopyon. Iris normal, pupil wide.

The eye was enucleated and a microscopic examination made.

Classification : The bacillus, in morphology and biology, belongs to the hay bacillus group. It differs from this in being Gram-negative. Fuchs thinks this bacillus can set up a keratitis with characteristics peculiar to this infection.

There are two illustrations of cultures, and one of a section of the rabbit's cornea. S. HANFORD MCKEE.

(4) **Scarlett,** of the Lariboisière Hospital, gives histories of a couple of cases of corneal ulceration due to two diplobacilli resembling morphologically the Morax diplobacillus and the diplobacillus of Petit, but differing from them in cultural and in staining characteristics. One of these, which the author names the ***bacillus duplex non-liquefaciens*** because it does not liquify gelatine or coagulated serum, caused a severe painful ulcer with hypopyon, which took a month to heal, and caused almost complete loss of sight in the affected eye from adherent leucoma. The second organism was distinguished from the other members of the group by being Gram-positive, and caused a relatively benign secondary infection of the cornea with slight infiltration and hypopyon in a tuberculous patient who had had an attack of herpes corneæ. The infection was completely cured in less than a fortnight. The appended table shows the characteristics of the four organisms belonging to this group in smears and cultures:

Media, etc.	Bacillus Duplex I, Diplobacillus of Morax.	Bacillus Duplex II, Diplobacillus Liquefaciens of Petit.	Bacillus Duplex III, non-Liquefaciens. (Scarlett)	Diplobacillus IV Josephi. (N.S. Chaillous)
Coagulated Serum ...	+liquefaction	+liquefaction	+(without liquefaction)	+feeble (without liquefaction)
Gelatine	−	+liquefaction	+(without liquefaction)	−
Ordinary Agar ...	−	+	+	+
Ascitic-Agar	+	+	+	+
Potato	−	+feeble	−	−
Ordinary Bouillon ...	+feeble	+feeble	+	+
Ascitic-Agar at room temperature	−	+	+	?
Staining by Gram's method	−	−	−	+

R. J. COULTER.

(5) **Brown, Irons**, and **Nadler,** obtained hæmolytic streptococci from the tear sac of a patient, and after various periods of growth on laboratory media, injected the organisms intravenously in rabbits. They found that the power of the hæmolytic streptococcus to localise in the eye and produce irido-cyclitis in rabbits was lost in a relatively short time, either in the tear sac of the original host, or in cultures, or in its passage through animals. This change in tissue localisation was not associated with any demonstrable decrease in lethal power. The hæmolytic properties and fermentative reactions of the streptococci were studied from time to time; the failure of the later cultures to produce lesions in the eyes of rabbits did not appear to be accompanied by any constant alteration in the fermentative power, but some decrease in hæmolytic properties was noted. R. H. ELLIOT.

(6) Pyocyaneus keratitis must be a rare condition. **Lamb, Colhoun**, and **Alt,** record two cases in each of which the infection was mixed. In the first case, that of a woman, aged 29 years, the bacillus pyocyaneus was only isolated after several animal inoculations, the staphylococcus aureus being extremely prominent. In the second, that of a girl, aged 11 years, the authors did not get the case until five days after the infection (with a piece of firewood.) Here, having had experience of the clinical appearances in the previous case, they suspected the pyocyaneus, looked for it at once and found it, though mixed with staphylococcus albus. Leaving on one side the description of the methods employed in finding

the bacillus, one may profitably quote the authors' remarks as to the characteristics of infection with this organism.

"It would seem that ulcers caused by the B. pyocyaneus have a distinct pathology of their own. Typical corneal infections by this organism when once observed and identified are easily recognised when met again. They are distinguished most certainly by their very rapid and extensive progress over the surface and into the substantia propria of the cornea, three to seven days sufficing for this bacillus to destroy corneal tissue over its almost entire extent, and in depth from one quarter of the corneal thickness to Descemet's membrane. The suppurating process is apparently self-terminating, being unaffected by the ordinary measure (? measures) for corneal ulcer. At the termination of the tissue destruction the slough is entirely thrown off and the clean transparent floor of the ulcer appears in strange contrast to the surrounding hazy infiltrated margins. The extracellular toxin produced by the B. pyocyaneus is said to contain a trypsin-like ferment which would explain its amazing power of destroying corneal tissue. Its poison being extracellular suggests the possibility of obtaining an antitoxin by injection of the bacillus into animals, just as in the case of diphtheria and tetanus. Fortunately these ulcers are too rare to warrant the formation and keeping on hand of stock preparations of pyocyaneus antitoxin."

ERNEST THOMSON.

(7) *Apropos* of the communication abstracted above (*see* No. 4) **Scarlett** has now established the fundamental difference between the bacillus duplex non-liquefaciens and the Morax diplobacillus and that of Petit by means of agglutination and precipitation tests. He adopted the method employed by Chaine (*Ann. d'Oculistique*, 1914, T. 152, p. 330) in his comparative study of the diplobacilli of Morax and Petit respectively. Chaine showed that the serum of a rabbit inoculated with the Morax bacillus produced agglutination with that organism and occasioned precipitation in certain dilutions. On the contrary, the serum failed to yield the same results with the Petit diplobacillus. It was further shown that Petit's diplobacillus yielded a serum specific as regards that organism, but one which caused neither agglutination nor precipitation with the Morax diplobacillus. Following the same lines of research, Scarlett now shows that the diplobacillus duplex non produces a serum, specific for that micro-organism, but having no action as regards the two others.

S. S.

VI.—TUMOURS OF THE OPTIC NERVE.

(1) **Segi, Motoo.—A case of myxosarcoma of the optic nerve. (Ueber einen Fall von Myxosarkom des Sehnerven.)** *Klin. Monatsbl. f. Augenheilkunde*, May, 1913.

(2) **Hudson, A. C. (London).—Primary tumours of the optic nerve.** *Royal London Ophthalmic Hospital Reports*, Vol. XVIII, Part iii, p. 317.

(3) **Heed, Charles R. (Philadelphia).—A case of primary intradural tumour of the optic nerve.** *Trans. American Ophthalmological Society*, Vol. XIV, Part i, 1915, p. 331.

(4) **Knapp, Arnold (New York).—A primary tumour of the optic nerve, successfully removed, with preservation of the eyeball, by the Krönlein method.** *Ibidem*, page 335.

(5) **de Schweinitz, G. E. (Philadelphia).—A contribution to the subject of tumour of the eyelid and orbit.** *Ibidem*, p. 341.

(6) **Ellett, E. C. (Memphis).—Intradural tumour of the optic nerve.** *Transactions of the Twentieth Annual Meeting of the American Academy of Ophthalmology and Oto-Laryngology*, 1915, p. 297.

(1) **Segi's** case was in a female child, seven years old, of rickety constitution. There had been increasing prominence of the left eye for two years. The left eye was markedly prominent and rotated down and out. There was great limitation of movement. There was complete blindness of the eye, and ophthalmoscopic examination showed optic neuritis subsiding into atrophy. The right optic disc also showed atrophic pallor. Fingers could be counted at four metres, and there was contraction of the field of vision. The contents of the left orbit were removed, and showed a large egg-shaped tumour embracing the optic nerve right up to its entry into the globe. It was found to be a fibro-myxo-sarcoma of the nerve taking origin from the inner sheath and the perineurium.

From a review of the literature in general, and the work of Salzmann in particular, it appears that myxosarcoma does not possess the power of unlimited growth. It may, therefore, be placed among the benign tumours, the prognosis after removal of which is good. Since these form the majority of tumours of the optic nerve, the prognosis after removal of optic nerve tumours, in general, may be said to be favourable. The exceptions are chiefly those of the dural sheath, which are apt to be sarcomata or endotheliomata of great malignancy. A. J. BALLANTYNE.

(2) This elaborate paper by **Hudson**, is written for the purpose of making a fresh classification of this group of tumours, based on a critical examination of records of cases, and especially of the histological features. The groups are as follows:—

(i) "A degenerative gliomatosis, implying a generalized overgrowth of neuroglial tissue, of infiltrative character, dependent on some degenerative change in the tissue of unknown ætiology." These are found chiefly in the young, are of slow growth, and may not involve the anterior part of the optic nerve, and in many instances have intra-cranial extensions. The growth occurs within the dural sheath, affecting the pial sheath and the nerve; there are certain typical cells, and often a mucinous material between them, and sometimes a fibrillated material. Defect of vision generally precedes exophthalmos, which is of slow development, and mostly in the direction of the axis of the orbit. Movement of the eye is most often only slightly limited, but may be abolished. The optic disc may show papillœdema or post-neuritic atrophy, and the visual defect may be out of all proportion to the ophthalmic signs. Intracranial growth may be very slow, and not give rise to severe symptoms; the patient may succumb to some other illness. Removal after division of the external canthus is advocated rather than by Krönlein's operation, and local recurrence is unknown.

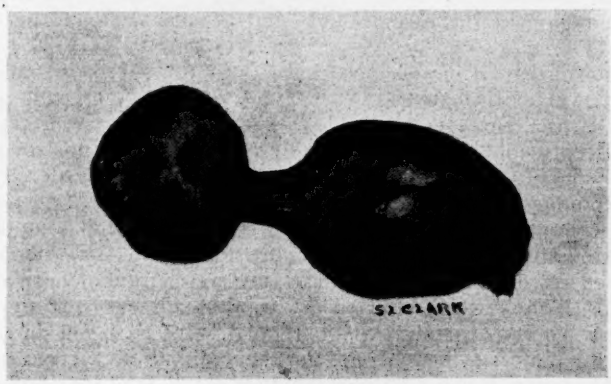
(ii) Fibromatosis of the nerve sheath. The marked feature in this set is the large development of fibrous tissue. These also appear early in life, and are of slow growth; exophthalmos precedes visual defect, and the fundus change suggests obstruction of retinal circulation, followed by atrophy of the nerve.

(iii) Endothelial tumour of the nerve sheath. This resembles the endothelial tumour of the cerebral meninges, with whorled arrangement of cells and central laminated concretions. The growth may form a cup, in which the globe rests. The arachnoid endothelial cells are probably the origin of some of these growths, although, in the opinion of some, they may also arise in the dura. These tumours appear later in life than those of the previous groups, failure of sight is secondary to tumour formation, exophthalmus having existed without alteration in vision. The rate of growth is slow, protrusion is often down and out; movement is, as a rule, limited, as the anterior part of the nerve may be affected; the fundus shows vascular obstruction and nerve atrophy. Extension may occur into neighbouring parts and the cranium. Local recurrence is not frequent after operation, and it is probably advisable to remove the globe. A. H. PAYAN DAWNAY.

(3) The case reported by **Heed**, occurred in a girl, aged ten years, whose left eye was noticed to be prominent almost coincidently with vaccination. In four months the eye had become very prominent, and sight was reduced to perception of light. The

protrusion of the eyeball slowly increased, despite treatment carried out with mercury and iodides for a period of six months.

When examined by Heed, twelve months after the onset, the left eyeball was thrust forward approximately 2 cm., and the summit of the cornea was directed down and in. Rotation was limited externally and absent in an upward direction. V.=no p.l. Palpation failed to discover any growth in the orbit. Posterior synechiæ. Optic disc greyish-white.



As to treatment, after an external canthotomy had been performed, a tumour was found to extend from the globe well back to the optic foramen. The tumour, together with the eyeball, was enucleated. The appearances of the tumour are shown in the accompanying figure. It was a spindle-shaped mass of dark-red colour, measuring 35 mm. in length and 26 mm. at its point of greatest thickness. Its capsule was formed by the dura. It was believed that the tumour in this case might properly be classed as an endothelioma.

Heed points out that his case agrees in history, symptoms, and general charaetcristics with the majority of those already reported—early age of patient, absence of pain, no injury, slow development of the proptosis, good health of the patient, presence of a post-neuritic atrophy, and, lastly, the inability to palpate any orbital growth.

S. S.

(4) **Arnold Knapp** adds another case of tumour of the optic nerve.

The patient, aged nine years, had suffered for a year from a slowly increasing prominence of the right eye. The eye was pushed straight forward in the axis of the orbit; the mobility of the eyeball was normal; no tumour could be found in the orbit; but sight was

reduced to perception of light in the extreme temporal field, owing to a neuritic atrophy of the optic disc.

Krönlein's operation was performed and a bluish mass extending from the eyeball to the apex of the orbit was removed, the eyeball being left in place. An infection, apparently localised to the subcutaneous tissue, followed the operation, but it rapidly subsided and the patient made a good recovery. Finally, except for a dilated pupil, the eye looked perfectly normal. The optic nerve was completely white; some of the retinal vessels were narrow to the point of obliteration; there were atrophic and pigmentary changes in the region of the macula and on the nasal side of the optic disc.

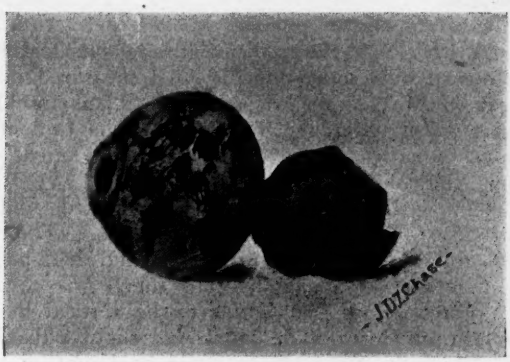
The excised part of the optic nerve and tumour consisted of an irregular, cylindrical-shaped mass, 3 cm. long, by 2 cm. wide at its broadest part, entirely surrounded by a connective tissue capsule, which represented the extended dural sheath. The microscopical appearance of the growth suggested a hæmangioma.

In commenting upon the foregoing case, Knapp draws attention to the changes in retinal circulation which occur. For example, in his case, notwithstanding complete division of the optic nerve and its blood-vessels, the retinal arteries and veins were of normal size for at least three weeks after operation, although subsequently some of them became narrow and obliterated. It has been shown by Schlodtmann that the changes in the ophthalmic picture of the retinal circulation depend upon whether a collateral circulation has been established or not. He also draws attention to the ofttimes incomplete removal of these tumours of the optic nerve, which, according to Hudson, occurs in no less than 50 per cent. of the cases. Thus, in his own case, the tumour was not limited to the apex of the orbit, and had, without doubt, extended into the cranial portion of the optic nerve. There are no clinical signs, however, of any intra-cranial extension, but then about six months only have elapsed since the date of operation. In connection with the general impression that these tumours are almost benign, it is significant that not a single instance of orbital recurrence has been recorded. As *X*-rays seem to possess a distinct effect on the growth of gliomatous tissue (Axenfeld), Knapp enquires whether the systematic use of *X*-rays should not constitute a part of the treatment of these cases. S. S.

(5) In the course of a brief abstract it would be impossible to do justice to this communication by **de Schweinitz**, dealing with certain tumours of the eyelid and of the orbit. The contribution is most liberally illustrated.

The first of de Schweinitz's cases was an example of myxosarcoma of the upper eyelid in a boy, aged 4 years. It had been mistaken for a hæmatoma, and twice operated on. The child died three and

a half to four months after these operations. The growth (examined after death), which much resembled in appearance the cerebellum, had a weight of 247 grammes and measured 10 cm. by 8 cm. by 6 cm. Microscopically, it was found to be a myxosarcoma.



The second case, one of small round-cell sarcoma of the orbit, occurred in a woman, aged 49 years. During the fifth year of its existence, purulent keratitis of the corresponding eye developed. The contents of the orbit, including the tumour, were eviscerated, and six months later, the patient was in excellent general condition.

A third case, one of tumour of the optic nerve, was in a girl, aged 11 years, whose right eye had been growing prominent for some years. On examination, V.=no p.l. Eye divergent and slightly depressed. Movements upward and outward limited. Optic disc atrophic, without evidence of preceding neuritis. Pupil failed to respond to light. Operation advised but declined. Four years after the first examination, and about eight years after the signs of proptosis had first appeared, an increase in exophthalmos was evident, and the patient began to experience orbital, periorbital, temporal, and parietal pain. Occipital headaches were also present. Consent for operation having been given, the eyeball, together with an attached growth, was removed. The appearances are shown in the figure. The tumour was dense in structure, reddish-yellow in colour, and 2.5 cm. in length by 2 cm. in width. Some two months after operation, there was a return of periorbital pain, and a suggestive fulness in the orbit, especially upward and inward. A month later, there seemed to be no doubt that a recurrence of the growth had taken place; but the swelling was lessened, and the pain decreased, by two applications of radium. Evisceration of the orbital contents, however, became necessary, and much difficulty was experienced in removing

the mass, since it was almost cartilaginous in its consistence. Two months after evisceration (with no signs of local recurrence), there were attacks of cerebral vomiting, suggestive of intracranial extension; but these gradually ceased. At the time of the report, ten months after the evisceration of the orbit, the patient was in excellent health.

The last case was one of epibulbar lipoma, met with in a woman, aged 41 years. It extended into the orbit for a considerable distance, and was removed with some difficulty. It measured nearly 3 cm. by 2½ cm. in width. As regards structure, it was frankly adipose. As regards diagnosis, Lagrange states that if the tumour is a pure lipoma, the conjunctiva moves freely over it; whereas if it be a dermolipoma, the conjunctiva adheres to it. S. S.

(6) A negro girl, aged 3 years, was admitted under **Ellett**, on account of exophthalmus affecting one eye. The lesion was supposed to follow a blow upon the eye, and had been present for a few months. On examination, there was found to be 12 mm. of protrusion of the right eye, the vertical movement of which was entirely lost. The pupil was slightly dilated and did not respond to light, but nothing could be found in the fundus to account for the blindness which was believed to be present. Ophthalmoscopic examination, *X*-ray examination, and nasal examination all yielded negative results.

It was determined to remove the tumour. As soon as the nerve was located, it was found that this structure was materially enlarged, and in following it backward, the enlargement persisted until the optic foramen was reached. The nerve was cut level with the foramen, and apparently the intracanalicular part of the nerve was affected by the same process which caused the enlargement of the orbital portion. The tumour, when removed, measured 3 cm. in length and 0·5 cm. in thickness.

The microscopic report of the case was to the effect that the tissue affected is neuroglia, as shown by the differential staining. For example—(1) Van Gieson's stain showed that the major portion of the hyperplastic tissue was not connective tissue. (2) With Mallory's aniline blue stain connective tissue appears blue, while the neuroglia fibrils appear red or light-red. In sections of the tumour under discussion practically the whole of the hyperplastic tissue took this red or light-red stain. (3) With phosphotungstic acid hæmotoxylin connective tissue appears red or reddish-brown, while glia tissue appears blue. Practically all the hyperplastic tissue in this specimen appeared blue.

The communication is extremely well illustrated. S. S.

CORRESPONDENCE.

INTRA-CAPSULAR EXTRACTION OF CATARACT

To the Editor, THE BRITISH JOURNAL OF OPHTHALMOLOGY.

SIR,

As the *Ophthalmic Review* has ceased to exist, having become merged in THE BRITISH JOURNAL OF OPHTHALMOLOGY, I would ask the favour of a little of your space to reply to Colonel Fisher's remarks on "Intra-capsular Extraction of Cataract" in the last number of the former journal, as he has referred to my work therein. The term "complete operation" is objectionable as being a slur upon extraction; "expression" is definite and precise, and indicates one of the main features of the operation—*viz.*: the squeezing out of the lens. I used this term in my "Manual of Ophthalmic Operations," published in 1908, and it has been adopted by Continental surgeons. As regards Colonel Fisher's saying, that we condemned Smith's operation before seeing it, I would say that I saw Smith do it several times, and operated upon some cases under his direction a year before publishing a qualified approval of it in the book above referred to. Latterly, I have almost ceased to do the operation; partly because of the frequency of complications, prolapse of vitreous and iris (quite the most troublesome of all, as Colonel Fisher and American writers will agree) and ruptured capsules, and partly because of poorer average visual results after it. In 1,325 cataract operations performed by me in hospital practice in 1916, only 26 were expressions in the capsule. I do not share Colonel Fisher's hopeful views of the future of expression, though I am far from minimising the drawbacks of cortex troubles. If increase in operations in a place forms an argument in favour of an operation, I might quote my own increase here from 478 to 1,325 annually (in spite of woeful lack of accommodation) as an argument in favour of extraction, but so many factors are concerned in the increase that I do not think it a very certain indication, though it is valuable, *ceteris paribus*, no doubt. I agree that expression does not abolish suppuration, as claimed by its advocates; and, personally, I have not succeeded in reducing suppuration below one per cent., though one may have a run of over 100 operations without one. Preliminary bacteriological examinations of the conjunctival sac in all cases (with treatment of infected conjunctivæ) have been introduced into one of the hospitals under my control for over a year now. The results have been disappointing, and the incidence of sepsis has not been abolished or even reduced as much as was hoped, so

difficult is the sterilisation of the conjunctival sac and the adjacent passages. Yours, etc.

F. P. MAYNARD, Lieut.-Col. I.M.S.
Professor of Ophthalmic Surgery,
Medical College.

CALCUTTA,
4th February, 1917.

BOOK NOTICES.

Transactions of the Ophthalmological Society of the United Kingdom. Vol. XXXVI. Session 1916. London: J. & A. Churchill, 7, Great Marlborough Street. 1916.

The present volume of the *Transactions* includes the proceedings of the Ophthalmological Society of the United Kingdom during its thirty-sixth session, April, 1916. Although it bears the date 1916, it did not come into the hands of members until recently. As usual, it forms a substantial book, well illustrated with plates and diagrams. Such of its contents as are suitable will be abstracted in due course in these columns. Among other contents we may note that it contains accounts of two important discussions:—1. On the treatment of syphilitic eye affections by the newer methods; 2. On foreign bodies in the eye and orbit, with special reference to prognosis and treatment; not to mention the interesting Report of the Committee on Detachment of the Retina, appointed at the 1915 Congress.

S. S.

Exophthalmos, its causes and diagnosis. By R. BEATSON HIRD. The Richard Middlemore Post-Graduate lecture for 1916. *Birmingham Medical Review*, Nov.-Dec., 1916.

In this lecture, Beatson Hird has confined himself to the ætiology and differential diagnosis of protrusion of the orbital contents.

The first three pages contain a brief account of the surgical anatomy of the region of the orbit.

The author next classifies the various causes of protrusion of the orbital contents, the majority of cases being due to some encroachment on the orbital cavity as a result either of deformity of the orbital walls or increase of the orbital contents.

The list given is a very complete one. Our own experience, however, fails to confirm the author's statement that hydatid cysts frequently develop in one of the ocular muscles.

A second group of cases is mentioned as due to diminished retraction following paralysis of the oculomotor nerves and tenotomies of the ocular muscles. Finally, there is a third group due to "protraction" of the globe, such as is found in Bright's disease. In this condition Hird considers that the "protraction" is probably due to a circulating toxin acting as a sympathetic stimulant, as may also be the case in Graves' disease.

The rest of the lecture deals with the diagnosis, and does not call for any special comment.

The lecture was addressed to the general practitioners of the Birmingham district, and draws attention to a number of facts easily overlooked or forgotten in the investigation of this class of case. E. E. H.

Diseases of the Eye. By G. E. de SCHWEINITZ, M.D. 754 pp., with 386 text illustrations and 7 chromolithographic plates. Price 25/-. Eighth edition. 1916. W. B. Saunders & Co., Philadelphia and London.

The fact that an eighth edition of this work has been required so soon as three years after the last, is a sufficient indication of its deserved popularity. The present edition contains numerous additions and alterations necessitated by recent advances in ophthalmology.

Two specially noteworthy features are the inclusion of an account of corneo-scleral trephining, written by Lieut.-Col. R. H. Elliot, and a description by Dr. W. M. Sweet of his method for localising foreign bodies. Nothing of importance in recent ophthalmic work appears to have been overlooked. The chapter on iritis has been largely rewritten, in order to give sufficient weight to the now generally recognised theories as to the frequency of its toxæmic origin.

The illustrations are very numerous, and, as a whole, of excellent quality, although the tints of some of the coloured plates are not quite satisfactory.

The only criticism we would like to make is, that there is not quite enough of the author, by which we mean that in several of the articles a more definite expression of opinion from de Schweinitz himself, as a result of his great experience, would certainly add to their value.

A full and excellent index—a most useful feature, and one too often neglected—is added.

The type, paper, and general get-up of the book do credit to the publishers. E. E. H.

NOTES.

Deaths.

WITH regret we announce the death, on March 10th, 1917, from influenza, of Patrick W. Maxwell, at the age of sixty-one years. Although he practised for many years in Dublin, he came of an old Ayrshire family, and received his medical education at Edinburgh and Vienna. He was surgeon-aurist in ordinary to His Excellency the Lord Lieutenant of Ireland, for his practice was not wholly confined

to eye work. He was an examiner in ophthalmology in the Royal College of Surgeons in Ireland. Among the ophthalmic appointments held by Mr. Maxwell may be mentioned that of ophthalmic surgeon to Dr. Steevens' Hospital, to Jervis Street Hospital, and to the Royal Victoria Eye and Ear Hospital. He served as a councillor of the Ophthalmological Society of the United Kingdom from 1900 to 1902, and from 1912 to 1915 filled the office of vice-president. He had written upon symblepharon, squint, accommodation, and the operation of capsulotomy. It is of interest to note that one of his three daughters is a member of the Ophthalmological Society of the United Kingdom, practises ophthalmology, and is at present in the service of the War Office at Malta. In 1916 she delivered the Mary Louisa Prentice Montgomery lectures.

Captain John Cropper, R.A.M.C., of Chepstow, Mon., who perished in the Hospital ship "Britannic" (torpedoed in the Ægean Sea in November, 1916), was the son of the late Mr. E. W. Cropper, of Gainsborough, and was born in 1864.

He was educated at Charterhouse, Trinity College, Cambridge, and St. Bartholomew's Hospital. He became M.B., B.C. of his University in 1892 and M.D. in 1901.

Captain Cropper was a man of great natural ability and with very varied interests, many of which he pursued with enthusiasm. Apart from strictly professional subjects, he had devoted much attention to painting, botany, motor engines and motoring, and gardening, especially rose-growing.

He was interested in missionary work, and had spent many months in Palestine and other Eastern Countries as a Medical Missionary. His professional interests centred in ophthalmology and the study of malaria. He was a member of the Ophthalmological Society of the United Kingdom.

He joined the R.A.M.C. in 1915, having previously spent several months in France in the services of the British Red Cross Society. His promotion to captain was published in the *London Gazette* a couple of weeks after his death.

He leaves a widow, two daughters and a son. The latter holds a commission in the R.F.A. and is on active service.

The death is announced of Théodore Guilloz, a pupil of the distinguished French *savant*, Augustin Charpentier. At one time he was much occupied with questions of physiological optics, and was one of the first to obtain good photographs of the fundus of the eye. After the discovery of the X-rays in 1896, Guilloz devoted himself to radiography, and founded at the University of Nancy the departments of electro-therapeutics and radiography. Indeed, he fell a victim to the Röntgen rays. He died at the early age of forty-nine years.